FCA
FIAT CHRYSLER AUTOMOBILES

October 26, 2018

To: **U.S. Environmental Protection Agency**
EPA Docket Center
Air and Radiation Docket
Mail Code 28221T
1200 Pennsylvania Avenue NW.
Washington, DC 20460

U.S. Department of Transportation
Docket Management Facility,
M–30 West Building
Ground Floor, Rm. W12–140
1200 New Jersey Ave SE
Washington, DC 20590

****** PUBLIC VERSION *******

Re: **FCA Comments on The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks Notice of Proposed Rulemaking**

Docket ID Numbers: EPA-HQ-OAR-2018-0283; NHTSA-2018-0067
VIA Regulations.gov http://www.regulations.gov

FCA US LLC (FCA) respectfully submits the following comments in response to the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks Notice of Proposed Rulemaking (NPRM).[1] Supporting information and additional detail are provided in the attached Appendices, which contain FCA Confidential Business Information (CBI). FCA also helped compile and supports the comments submitted by the Alliance of Automobile Manufacturers (the Alliance).

Introduction

FCA is a North American automaker based in Auburn Hills, Michigan. It designs, manufactures, and sells or distributes vehicles under the Chrysler, Dodge, Jeep®, Ram, FIAT and Alfa Romeo brands. In 2017, FCA sold over 2 million vehicles in the U.S. FCA employs more than 62,000 individuals in the U.S., and since 2009, the Company has created more than 30,000 jobs and invested more than $10 billion in the U.S. Improving the fuel economy and greenhouse gas emissions of our products is important to FCA, our customers, U.S. energy security and the environment.

FCA supports continued improvement in fuel economy from today's levels, and we are investing billions of dollars in fuel saving technologies across our product lineup. Some highlights at FCA include: our new family of downsized and boosted direct injection engines, implementation of wide-ratio 8 and 9 speed transmissions, the class leading Pacifica Plug-in Hybrid Electric Minivan, the battery electric Fiat F500e, the introduction of eTorque 48V mild hybrid technology on V6 and V8 Ram pickups, the application of stop-start technology across multiple products, and our announcement of a Plug-in Hybrid Electric Jeep Wrangler.

[1] 83 Fed. Reg. 42986 (Aug. 24, 2018).

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Current Market is Different than 2012 Assumptions

The automotive market today is different from what we – regulators and industry, alike – predicted it would be in 2012. Unanticipated shifts in gas prices, consumer preferences and the lack of penetration of alternative fuel technologies are the primary reasons that in MY2016 the industry as a whole failed to meet fleet-wide fuel economy standards for the first time without using credits earned in previous years – and is projected to fall further behind in the coming years. The final rule must be based on the market realities of today and provide a pathway to compliance on that basis.

In the original regulation establishing standards for MY2017–2025 greenhouse gas emissions and fuel economy, gas prices were predicted to be over $4 per gallon by 2018, while today's actual prices are under $3 per gallon. For the NPRM the agencies lowered fuel price assumptions through 2025 by 30% to 40% using Department of Energy forecasts – a significant drop from the levels projected in 2012. When gas is relatively inexpensive, fuel economy improvements save customers less money at the pump. Consumers in turn have less incentive to pay for expensive fuel saving technology, instead choosing to invest in other features or vehicle attributes like a more capable powertrain, a better infotainment package, or other non-auto priorities within their personal budget.

Second, the last several years have witnessed an organic shift in consumer buying patterns away from higher fuel economy small and midsize passenger cars toward more capable crossovers and utility vehicles. Industry and regulators clearly did not anticipate this market shift in 2012. The forecasts referenced by the agencies at that time showed cars increasing from 50% to 57% of annual vehicle sales by 2025.[2] However, as shown below in Figure 1, as of 2018, car sales have actually dropped to 31% of the total fleet– the opposite of the expected trend. Over the same period, the utility vehicle market share has grown from 32% to over 47%.

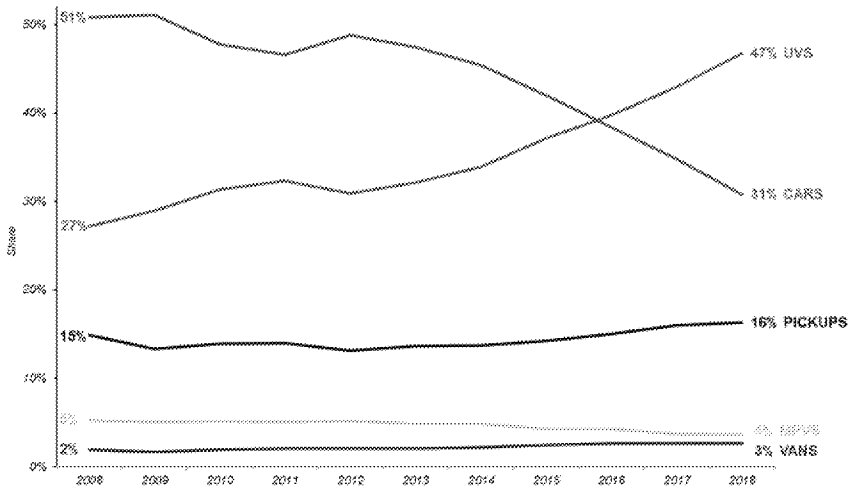

Figure 1: Market for cars is shrinking, displaced by growing demand for UVs

As shown below, this shift in consumer preference presents a compliance problem, even in a footprint-based standards system.

[2] 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62624, 62680 Table II-2 (Oct. 15, 2012).

A UV with the same footprint as a sedan can lose up to 4MPG.

As shown in Figure 2, a crossover or utility vehicle (UV) that has the same powertrain and technology as a sedan with the same footprint will achieve 2-4 mpg lower fuel economy. In a world of low gas prices, this has proven to be a trade-off that consumers are willing to make for the versatility of a crossover or UV. These real world market shifts were precisely the reason that the industry sought – and CARB/EPA/NHTSA agreed to – a midterm evaluation.

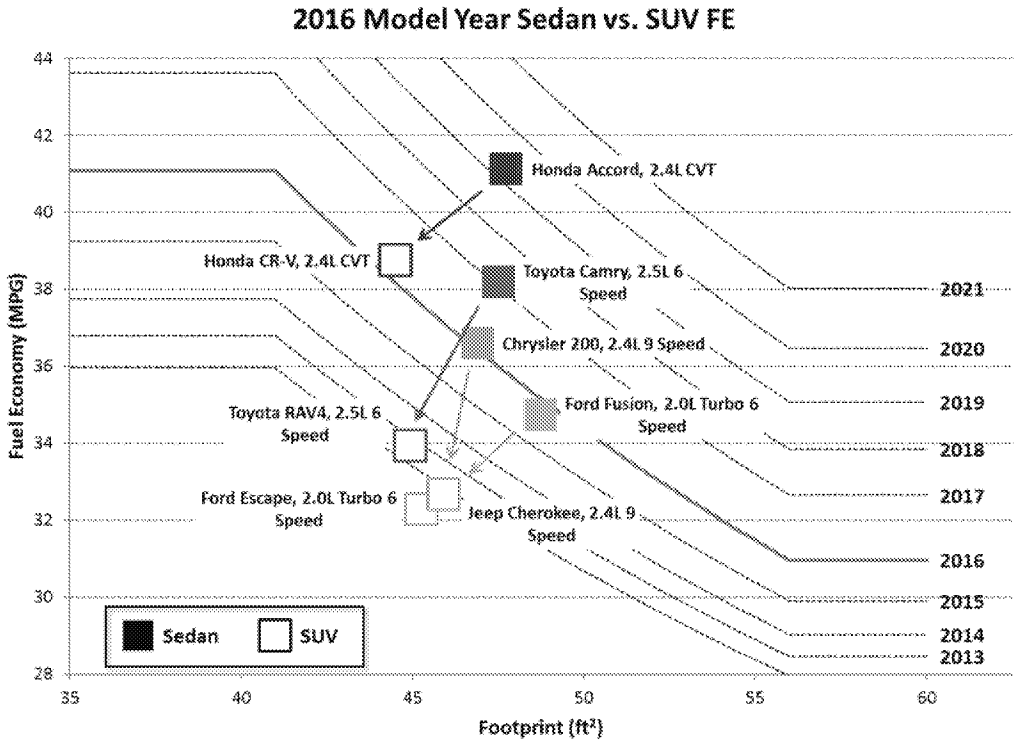

Figure 2: UVs can lose up to 4 mpg compared to sedans with the same footprint and powertrain technology[3]

Finally, even though the industry has more than quadrupled the number of hybrid and plug-in electric product offerings over the last decade, these vehicles collectively comprise a very small percentage of annual sales. These technologies are available across a range of vehicle types and price points. Plug-in hybrid and battery electric vehicles are eligible for significant federal tax credits and, often, state tax credits or other incentives such as access to high occupancy vehicle lanes or special parking. But while the industry is shifting more focus to develop electrification technologies, the combination of low gas prices and consumer concerns over product cost and range have inhibited uptake. The reality that residual values of electrified vehicles can be as much as 40% below those vehicles with a conventional powertrain compounds the financial concerns for prospective consumers. Even with the incentives described above, hybrid and plug-in electric vehicles still only account for 1.5% of US market, and the combined U.S. market share of all hybrid and plug-in electric products has remained virtually flat at roughly 3% as shown in Figure 3.

[3] Footprint data from CAFE Model for 2018 NPRM for Model Years 2021-2026 Passenger Cars and Light Trucks Central Analysis, *File:2018_NPRM_market_inputs_ref.xlsx*, available at https://www.nhtsa.gov/corporate-average-fuel-economy/compliance-and-effects-modeling-system; Fuel Economy data from 2016 FE Guide for DOE-OK to release-no-sales-4-27-2017Mercedesforpublic.xlsx available at https://www.fueleconomy.gov/feg/download.shtml.

Technology	*2008*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018-07*
HEV/PHEV/BEV/FCV	2.3%	3.7%	3.4%	2.8%	2.8%	3.2%	3.3%
HEV	2.3	3.1%	2.7%	2.1%	1.9%	2.1%	1.8%
BEV/PHEV	0%	0.6%	0.7%	0.7%	0.9%	1.1%	1.5%
Industry EV Model Count[4]	18	66	74	78	77	83	80

Figure 3: Market take rates for electrified products has remained low.[5]

In the 2012 Final Rule, EPA stated that MY2025 compliance could be achieved with minor levels of strong electrification. The Draft TAR and Proposed Determination also predicted low levels of electrification. FCA has informed EPA on numerous occasions, most recently in FCA's CBI comments to the Draft TAR, that the company projects compliance would require much greater levels of electrification. The industry has made similar comments highlighting the compliance need for more electrification. FCA believes, and 6 years of market performance proves, there is insufficient market demand for such high levels of strong electrification.

The Noncompliance Gap Demonstrates Regulatory Mismatch with Current Market Reality

Despite continued investment by FCA and its competitors, the industry failed to meet standards for the first time in MY2016 without using credits earned in previous years. That noncompliance gap (Figure 4) – which independent IHS forecasts estimate will grow to almost 3.5 miles per gallon by MY2020 – clearly demonstrates that the assumptions made seven years ago about the U.S. automotive market need to be corrected in this rulemaking.

Actual fleet performance is the most important and valuable metric agencies can and should reference in order to establish what the new plan should be moving forward. It represents what the market is accepting, the costs realized and the performance achieved. It provides a factual baseline – immune from rhetoric or politics – for establishing a new path forward.

[4] Minimum of one registration in a calendar year; each EV type is a unique count

[5] IHS Registrations through July 2018 excluding medium-duty, heavy-duty and bus.

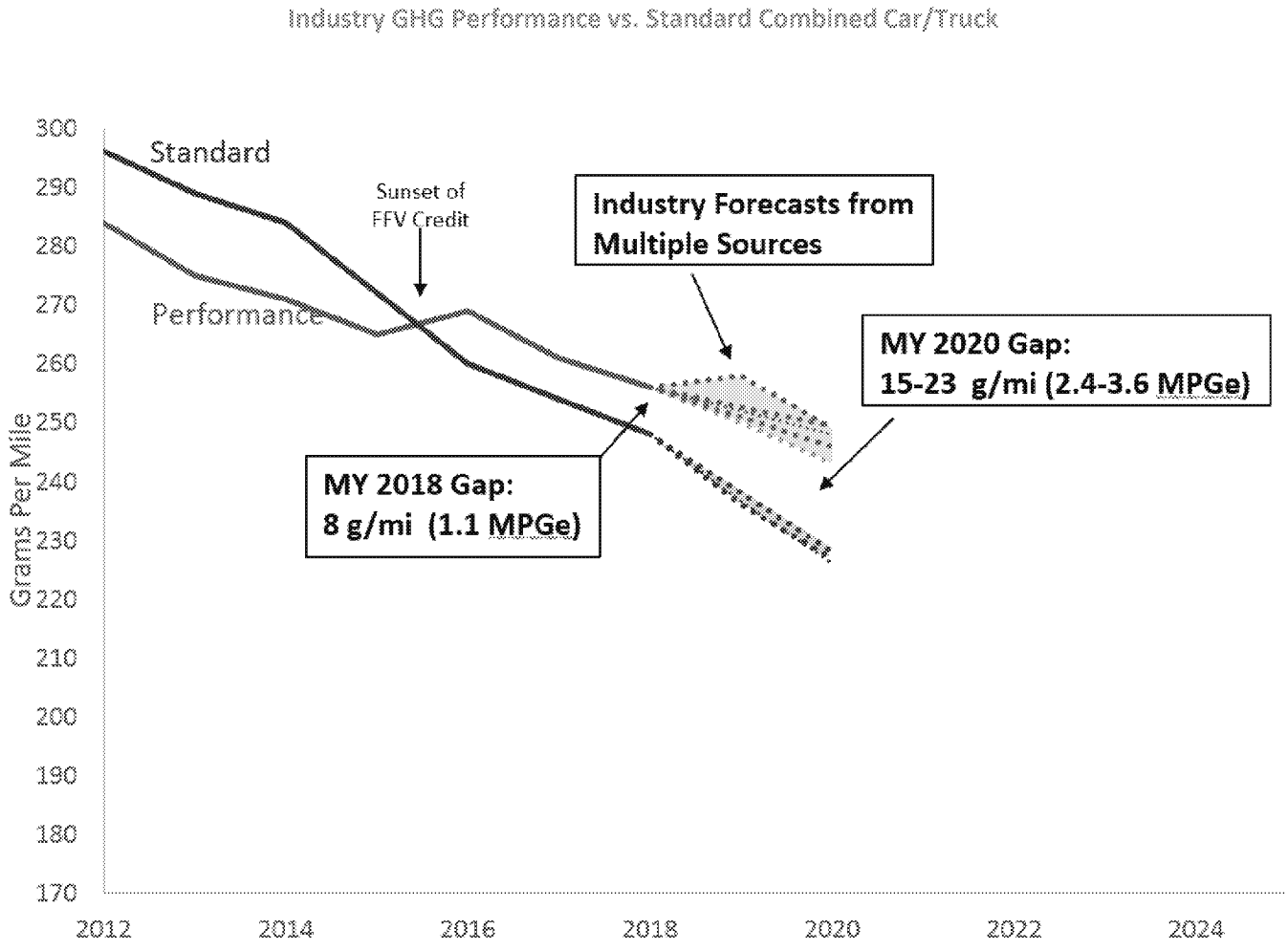

Figure 4: Industry is improving, but not at forecasted rates.[6]

Even with the agency-preferred alternative that keeps the MY2020 standard flat, the industry would need to continue to improve fuel economy and GHG emissions. In fact, to make up for the noncompliance gap and be credit neutral in MY2025, industry will need to improve at a rate greater than what has been historically achieved (see Figure 5). A flat standard drawn from an unachievable MY2020 target requires significant continued improvement by industry.

[6] MY2012-2016 standards and performance: EPA Manufacturer Performance Report for the 2016 Model Year (Jan. 2018); MY2017-2018 standards and performance: Novation Analytics Baseline Study (Oct. 2018); MY2019-2020 standards: NPRM Volpe Model central analysis (CO_2) (adjusted and not adjusted for AEO2018 car/truck mix); IHS Markit VPaC (Sep. 2018) 2019-2020 performance: IHS Markit VPaC (Sep. 2018); 1.3% per year (average MY2000-2011 tailpipe rate); 2% per year (average MY2005-2017 tailpipe rate); linear fit of 2012-2018; linear fit of MY2016-2018

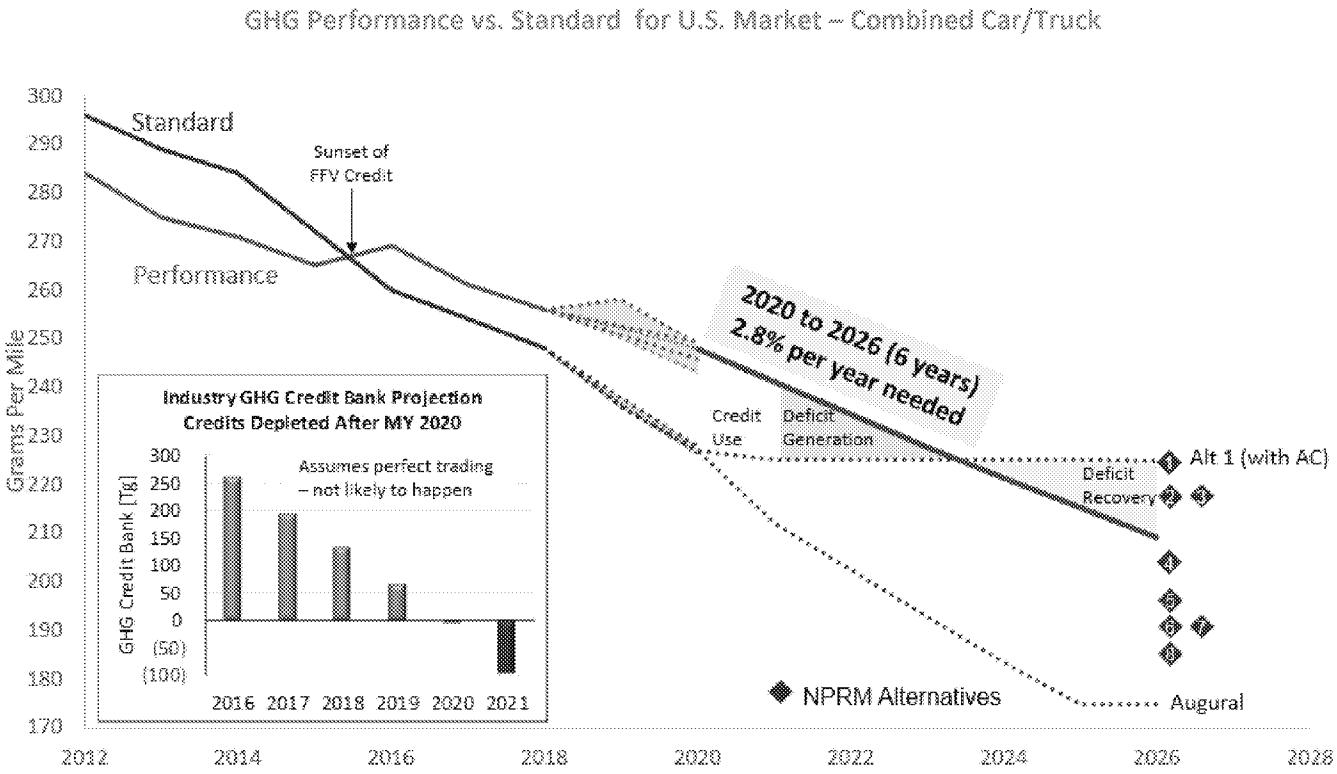

Figure 5: Future standards must recognize realities of industry performance and the compliance deficit[7]

Under the current regulation the industry is in a deficit position that will continue to grow through MY2020. In developing a final rule, the agencies must consider the fact that this deficit position more accurately reflects the confluence of technology costs, vehicle affordability and consumer preferences than the targets that were set in 2012 – and revise the targets for MY2021 accordingly.

FCA Agrees with the Agencies that Footprint Curves Need to be Adjusted

Overall or "net" stringency is a product of footprint-based requirements and flexibilities. The overwhelming industry consensus supports stringency reduction to better align with market realities. Added flexibilities that either help to quantify real world benefits not captured during laboratory conditions or help incentivize longer term technologies are one way to address net stringency (as opposed to footprint curve changes), but FCA believes that added flexibilities alone are not enough to address the issue and can cause other concerns. While the agencies have recognized the value of flexibilities, such as the alternative methodology process for off-cycle credits,[8] the process of fully acknowledging their benefit has been bureaucratic and lengthy with an uncertain outcome – actually working against the agencies' original intent to further promote these benefits.

In addition, when flexibilities are considered while setting targets, they cease to be flexibilities and become simply additional technology mandates. Further, in the current regulation certain flexibilities do not apply to CAFE and GHG programs equally. For example, Advance Technology Vehicle (ATV) Multipliers are a GHG-only flexibility that can help to incentivize advanced technology. If consumers responded, there would be a large impact on GHG net relief but ATV multipliers are not present in the CAFE program – resulting in further disharmonizing the CAFE and GHG programs.

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[7] *Id.*

[8] 40 C.F.R. § 1869-12(d).

FCA believes that changes to the footprint standards are the most direct and efficient way to provide the relief necessary while minimizing conflicts between the NHTSA and EPA programs and minimizing the agency resources necessary to administer the programs. If the agencies use added flexibilities to make stringency adjustment that both programs cannot accommodate equally, the agencies need to harmonize net stringency by increasing the offset in CAFE and GHG footprint curves. FCA supports ongoing fuel economy improvements in the fleet, but all policy adjustments need to acknowledge today's market realities are different from 2012 forecasts as described above.

FCA Supports Additional Flexibilities and Changes to the Compliance Programs

While FCA is recommending changing the footprint curves as the "priority" adjustment needed, addressing deficiencies in the existing flexibilities and adding new flexibilities can help incentivize advanced technologies (e.g., electrification) and provide a bridge to compliance if the necessary customer uptake of the electrification technologies does not develop in the market. FCA recommends the following:

Extend and Expand Existing ATV Multipliers

FCA continues to support working towards "One National Program" (ONP) that allows us to build one fleet that complies with NHTSA, EPA and CARB fuel economy and GHG regulatory requirements. With that said, we also recognize California's separate commitment to expanding high voltage electrification in the fleet. FCA supports a CARB-developed methodology [9] that scales ATV incentives over time using the cost-benefit ratio of the ATV compared to conventional vehicle with both benefits measured from the required standard. This methodology acknowledges that one way that an OEM can select a technology is based on its cost-benefit ratio, and having a multiplier available can incentivize that technology. This ratio by itself would equally balance the cost-benefit of the two technologies, so an adjustment factor is then used to tip the balance to incentivize the advanced technology and minimize the risk for manufacturers. The CARB methodology yields a 4.5 ATV multiplier for BEVs and a 4.8 multiplier for PHEVs. The calculations and further discussion on the ATV multipliers is contained in Appendix 1.

While one may question the size of the PHEV multiplier, EPA's costs for PHEVs (with their two powertrains) are almost as high as BEV costs, and the benefits are less. As a result, the PHEV calculations actually yielded higher multipliers than BEVs. These higher PHEV multipliers using CARB's method are supportable because BEV range anxiety is a major hurdle for OEMs. Without prevalent fast charging stations to address this BEV concern, PHEVs could be the dominant technology through MY2026 that bridges the gap until BEVs are more market acceptable.

Include 2WD SUV in LDT Fleet

2WD SUVs have a combination of truck-like characteristics (e.g., elevated/off-road seating position coupled with expanded cargo carrying ability) that customers prefer but they are saddled with increased energy demand driven by the fundamental physics of these consumer-demanded characteristics. The agencies should revise current truck-like criteria in order to align the regulation with the underlying physics by modifying 49 CFR § 523.5(a) to include:

- Extended roof-line and expanded cargo capacity (1 row fold flat), and
- <6000 lbs. GVWR and meets 4 out of 5 off-road criteria (from 49 C.F.R. § 523.5(b))

[9] Comment submitted by Michael Carter, Assistant Division Chief, Mobil Source Control Division, California Air Resources Board (CARB), https://www.regulations.gov/document?D=EPA-HQ-OAR-2014-0827-1968.

Expand Off-Cycle Credit Table Caps

From MY2012 to MY2016, industry's application of off-cycle technologies to the U.S. fleet has tripled[10] (2X on car fleet and 4X on truck fleet) to 3 g/mi. This is the application rate of technology resulting from an all-new regulatory mechanism – a recognition of technologies that have on-road fuel economy and GHG emissions benefits that are not completely captured during laboratory conditions. With this learning phase now complete, the industry expects this trend at a minimum will continue at the current rate but more likely accelerate, exceeding the existing 10 g/mi cap in the MY2021-2026 timeframe.

Knowing that this regulatory mechanism incentivizes industry innovation, manufacturers need regulatory certainty to fund the needed investments in the technology. Therefore, FCA recommends removing the 10 g/mi off-cycle table cap completely and unleashing industry innovation. Left in place, the agency cap is stifling the intent of the off-cycle mechanism.

The agencies specifically ask in the NPRM if the cap should be reset to 10% of an individual OEM's tailpipe performance or to 15 g/mi. These are both less desirable paths than completely removing the cap, because they still very likely could hamper certainty and thereby technology innovation and implementation. If a cap were deemed necessary, our preferred alternative is to set the cap at 10% of the individual OEM fleet's performance. This path works much like attribute-based standards. That is, it would acknowledge that a given technology would have a greater gram/mile savings if the base vehicle had higher energy demands (i.e., a large versus small vehicle). FCA's third choice would be the most limiting, increasing the cap to a constant 15 g/mi.

There is discussion in Appendix 2 that responds to NPRM questions about combining portions of the Off-Cycle and A/C tables. We believe the cap removal methodology applies to both of these currently separate regulatory mechanisms.

Improve Off-Cycle Technology Process

There are general efficiency improvements that would help with the administration of the off-cycle program that are discussed more in Appendix 1 and Appendix 2. These include, (1) simplifying the on table credit menu, (2) adding more technologies to the default table to avoid the lengthy alternative methodology, and (3) improving the alternative methodology approval process that has been lengthy and uncertain.

Retain Non-CO_2 Compounds (Low GWP Refrigerant, Methane, Nitrous Oxide)

FCA continues to support ONP for CAFE and vehicle GHG emissions and, as such, we support the Alliance position to keep low-GWP refrigerant, methane (CH_4), and nitrous oxide (N_2O) in the current regulatory structure instead of promulgating new, separate rules.

We believe leaving these compounds in the current rule is the best course of action. While the low-GWP refrigerants are a valid method of reducing GHGs, FCA is concerned that without a federal rule these could be regulated by a patchwork of differing state regulation. Regarding methane and nitrous oxide, we value the flexibility of offsetting overages with an equivalent CO_2 adjustment. This is most easily accomplished in the existing regulation, and we have concerns about how this would be addressed in a separate regulation. However, if it is determined that these elements will be part of a new rulemaking, we would work with the agencies to develop a rule that provides similar flexibilities.

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[10] U.S. Environmental Protection Agency, "GHG Emission Standards for Light-Duty Vehicles: Manufacturer Performance Report for the 2016 Model Year," EPA-420-R-18-002 Table 3.17 (Jan. 2018) (EPA 2016 GHG Performance Report).

In the proposed rule, "EPA also seeks comment on whether to change existing methane and nitrous oxide standards that were finalized in the 2012 rule."[11] FCA requests EPA eliminate the CH_4 and N_2O requirements completely. The Alliance made a similar request in its comments on regulatory burden relief in May of 2017. [12] There are at least four rationale for removing this requirement:

- Gasoline engine performance is within the current standards. Only a limited subset of vehicles, E85 FFVs (with declining sales) and diesel (with relatively low sales compared to gasoline), are challenged by the current CH_4 and N_2O requirements.

- The measurement of N_2O is burdensome and the technologies used to measure it are still evolving.

- Catalysts have limited impact on CH_4 and N_2O, as CH_4 can pass through the catalyst easily, and N_2O formation occurs inside the catalyst due to the incomplete reduction of NOx in the after treatment system.

- In EPA's 2016 GHG Performance Report, total industry CH_4 and N_2O emissions in excess of standards accounted for 0.045% of the total GHG emissions. [13]

Given this minimal contribution to the GHG inventory and the accompanying testing/reporting compliance burdens, FCA believes that the agencies' GHG goals could be achieved without regulation of CH_4 and N_2O.

If the regulation of CH_4 and N_2O continues, we believe that there should be an option for fleet averaging with family emission limits (FELs), similar to other substances that are regulated in the GHG and criteria emissions regulations, for both under and over the current standards. This would enable high performing applications to offset lower performing applications without introducing a CO_2 penalty.

FCA Supports NHTSA's Consideration of the Economic and Safety Impacts of CAFE/GHG Standards

As FCA has previously commented to the agencies, vehicles on the road today are approaching a record average age of nearly 12 years. As the cost of new technologies exceeds what customers are willing to pay, this average vehicle age may increase further as consumers decide to hold onto their current vehicles longer or purchase their next vehicle from the used vehicle market. In either case, the benefits of safer, cleaner, and more fuel-efficient vehicles are not realized.

The agencies acknowledged the risk of an aging fleet in the Draft TAR and FCA agrees with the latest concerns raised in this rulemaking as the agencies now assess the possible safety impacts of that outcome. FCA agrees with the agencies' concerns that an unintended consequence of the current augural stringency of the CAFE/GHG regulations may be a decreasing trend in vehicle scrappage rates as consumers delay purchases.

It is appropriate for the agencies to consider the improvement in consumer safety that could be impacted by delayed fleet turnover and the safety impacts of increased VMT when considering the stringency of the CAFE/GHG standards. The current CAFE/GHG regulation was developed with an expectation of high gas prices but is unfolding in a period of sustained low gas prices, strongly impacting payback (and consumer choice). Given lower gas prices, and a vehicle fleet with increasing gas mileage under the augural standards, the

[11] 83 Fed. Reg. at 42988.
[12] Alliance of Automobile Manufacturers Comments to EPA on OAR on Regulatory Burden, Issue 1.30, Docket ID #EPA-HQ-OA-2017-0190, (May 15, 2017).
[13] Calculated from data in EPA 2016 GHG Performance Report tbls.B-1, 3-23, 3-27, 3-28.

agencies' conclusions that consumers will make the economic choice to increase Vehicle Miles Travelled (VMT) is reasonable.

We provide further analysis of this point in Appendix 1.

FCA Continues to Support One National Program

FCA continues to support ONP for Corporate Average Fuel Economy (CAFE) and vehicle Greenhouse Gas (GHG) emissions and we were pleased when the White House and California Air Resources Board (CARB) issued a joint press statement at the end of August expressing the "shared goal of achieving one national set of standards for vehicle fuel economy and greenhouse gas emissions."[14] As stated in our public hearing testimony on September 25, 2018, FCA agrees with EPA and NHTSA that the most direct way to align the program with market realities is by adjusting the footprint curves that define a vehicle's basic fuel economy requirements. We also recognize California's commitment to expanding electrification of the fleet. It is our view that those two elements – standards adjusted to reflect market realities and expanded credits to incentivize electrification – could form the basis of a potential agreement.

FCA Agrees with the Agencies' Assessment of Preemption

As noted above, it remains our hope that conflicts over preemption will be avoided by an agreement to modify ONP to address evolving market realities; however, in the absence of such an agreement, FCA agrees that the law gives the federal government the authority to preempt state standards that are directly related to fuel economy. As described in the NPRM, "tailpipe CO_2 emissions standards are directly and inherently related to fuel economy standards." [15] The mathematical relationship between the two is undeniable, and our understanding of that relationship has only grown as the program matures. In addition, any state GHG standards that limit tailpipe CO_2 emissions would impact how manufacturers comply with federal fuel economy standards. As such, there is a strong argument that EPCA expressly and impliedly preempts state GHG standards that limit CO_2 tailpipe emissions. For similar reasons, ZEV mandates could reasonably be found to be preempted by EPCA as well.

Additional Recommendations Addressed in More Detail in FCA's Attached Appendices

The agency requested comment on a number of other specific issues. FCA responds in more detail to these requests in the Appendices, which provide the rationale for supporting each of the following recommendations:

- No changes are needed for the current vehicle classification/measurement procedures
- Maintain the CAFE credit trading program as-is with no additional reporting requirements
- Provide an Improved Off-Cycle Credit Approval Process
- Make certain procedural improvements to the 5 cycle process
- Better harmonize Off-cycle and A/C Efficiency (Indirect) credits in CAFE program
- Correct VMT used in early part of program to align with VMTs used for MY2017 through MY2025

Conclusion

We agree with NHTSA and EPA that the current standards are not appropriate. Market challenges that were not foreseen by the agencies at the time of their rulemaking in 2012 have since made it difficult for automakers to

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[14] Press Release, White House, Dep't of Transp., Envtl. Prot. Agency, Cal. Air Resources Bd., Joint Statement on SAFE Vehicles Rule (Aug. 29, 2018).

[15] 83 Fed. Reg. at 42987.

achieve the required GHG and fuel consumption reductions. The Mid Term Evaluation, agreed to by all stakeholders, was put in place to assess changes in the regulatory landscape, including market challenges.

FCA supports an alternative that allows industry and FCA to close the growing compliance gap with continued improvements from today's fuel economy and greenhouse gas levels at a challenging but market feasible rate. We believe the best 50-State NPRM alternative to accomplish this would include:

- Significant adjustment to the footprint-based standards (model-years 2021 to 2026) to reverse the widening compliance gap and its anticipated impact on credit availability, while maintaining performance improvement;
- Adjustments that equalize the larger compliance task on trucks versus cars today
  - Recognize 2WD UVs for their truck-like capability
- Extended/expanded multipliers for plug-in hybrid and battery-electric vehicles, under CAFE and GHG regulations, to encourage wider adoption of electrification as the industry continues to address those factors which limit its proliferation, i.e., infrastructure development, technology cost and vehicle range;
- Increased EPA GHG to NHTSA CAFE footprint curve offset to account for all differences that cannot be harmonized;
- Actions that reduce industry risk due to market uncertainty of advanced technologies, such as:
  - Extending/expanding ATV credits to further encourage advanced technology propagation
  - Expanding/simplifying off-cycle credit programs;
- Continued acknowledgement that upgraded refrigerants and improved refrigerant management benefit the GHG program;
- Freeing auto manufacturers from responsibility for upstream emissions produced during electricity generation;

FCA stands ready to work collaboratively with NHTSA, EPA and CARB to support the elements noted above to define a successful ONP for MY2021-2026.

Sincerely,

Mark Chernoby
Head of Vehicle Safety and Regulatory Compliance
FCA US LLC

Appendices

Appendix 1

1. FCA Agrees Current Standards are not appropriate

Affordability and Acceptance Modelling

As part of the Midterm Evaluation, EPA committed to analyzing and considering the economic feasibility of its GHG emissions regulations, with emphasis on the impact to consumer affordability.[16] EPA and the industry recognized the importance of being able to understand how customers trade-off increased upfront vehicle costs with the potential for long-term fuel savings.[17] FCA commented on the Draft TAR that many of the consumer-related topics reviewed by EPA and NHTSA proved inconclusive in being able to understand the impact of increased costs on expected consumer behavior. The agencies generally did not advance the understanding of this complex topic or create tools to include consumer effects in their technology modeling at that time.

FCA, the Alliance, as well as other stakeholders, submitted comments requesting a more thorough consideration of consumer acceptance, since the success of the regulation relies on consumers purchasing vehicles with higher fuel economy and lower CO_2 emissions. We commend EPA and NHTSA for carefully considering the feedback they received from stakeholders, and updating their analyses to take a more rigorous look at this key factor. We fully support the Alliance comments on the NPRM modeling results and how consumer affordability and willingness to pay impacted the agencies' overall decision on the standards.

The market is supporting less than 2% PHEV / BEV Electrification

In the 2012 Final Rule, EPA stated that MY2025 compliance could be achieved with minimal levels of strong electrification. The Draft TAR and Proposed Determination also suggested low levels of electrification were needed for compliance. In contrast to its position in rulemaking documents, EPA's MY2016 performance report noted that the only MY2016 products that could comply with MY2025 standards had strong electrification. FCA commented to EPA and NHTSA, most recently in comments to the Draft TAR, that much greater levels of electrification are needed for compliance. The Alliance had made the same point in its comment deck.

In the NPRM, the agencies updated Volpe modeling which directionally acknowledges FCA's assessment that higher rates of electrification would be required to meet the current standard than was originally predicted. Updated assessments by agencies from the new Volpe model are shown below in Figure 6. While FCA still believes greater penetrations of PHEV/BEV technology is needed, the number of strong hybrids have almost doubled from previous estimates in the agencies latest assessment.

[16] 40 C.F.R. § 86.1818-12(h)(1)(ii)–(v).
[17] 77 Fed. Reg. at 62784

	Augural	
	DTAR Volpe Model	NPRM Volpe Model
Mild Hybrid	14%	32%
Strong Hybrid	14%	24%
PHEV	<1%	1.1%
BEV	<2%	0.5%

Figure 6: Updated agency modeling recognizes that more HEV/PHEV/BEV technology will be needed to achieve the augural standard than was originally predicted.[18]

Manufacturers measure fleet compliance using a sales weighted fleet average calculation. The fleet has to meet the requirement on average. Vehicles that fall short of their targets can be offset by vehicles that over-comply to their targets.

A recent study performed by third party Novation Analytics (Figure 7) shows that the only products on the road today that meet the current standards beyond MY2024 are mild or strong hybrids and PHEV/BEV products. Perhaps more surprisingly, the same study shows less than a third of today's MY2018 vehicles will meet standards next year (MY2020 starts in January 2019). Put simply this means that no ICE-only products (currently making up over 95% of the market today) can be counted on to achieve compliance. This affirms FCA's positon that dramatically increased numbers of Hybrid and PHEV/BEV products are needed to achieve the current standard.

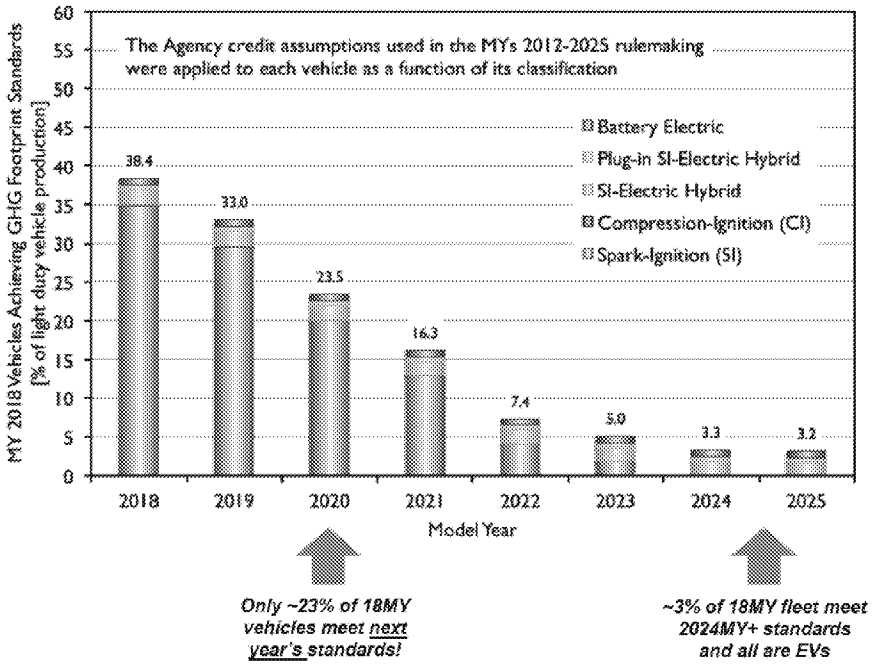

Figure 7: Novation Analytics analysis of the MY2018 fleet[19]

[18] Draft Technical Assessment Report, Table ES-3, page ES-10; 83 Fed. Reg. at 43267, Table VII-6.
[19] Novation Analytics, personal communication to Alliance of Automobile Manufacturers.

FCA believes the market demand for high levels of strong electrification is low – we can study the timeframe before and during current regulation. Figure 8 shows that over the last decade the number of hybrid and plug-in electric product offerings has quadrupled from 18 to 80. These technologies are available across a range of vehicle type and price points.

Figure 9 shows a further sales breakdown between HEVs, PHEVs, and BEVs. Plug-in hybrid and battery electric vehicles are eligible for significant federal tax credits and, often, state tax credits or other incentives such as High Occupancy Vehicle lanes or parking access, yet still only account for 1.5% of US market share.

Further, the combined U.S. market share of all HEVs, PHEVs, and BEVs has remained virtually flat at roughly 3.3%.

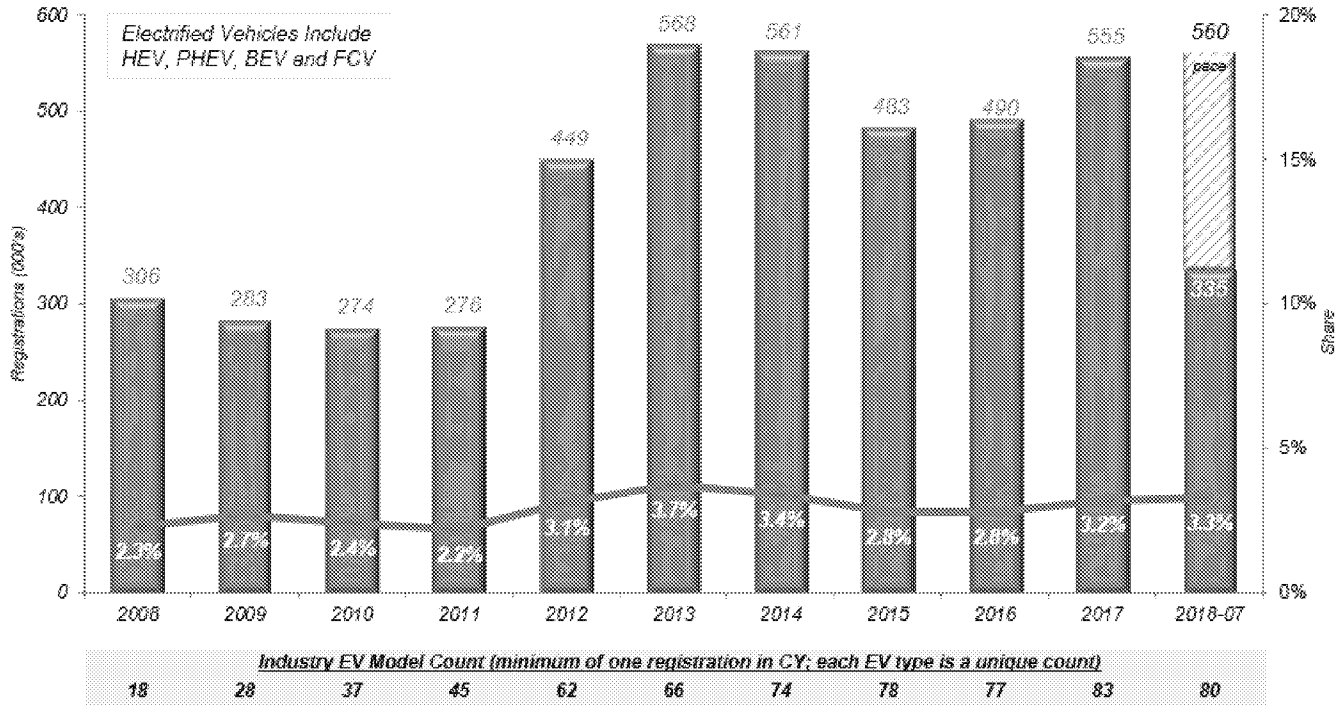

Figure 8: Industry has more than quadrupled EV models yet the market is flat at 3.3%[20]

[20] Source: IHS Registrations through July 2018 excluding medium-duty, heavy-duty and bus.

Technology	*2008*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018-07*
HEV/PHEV/BEV/FCV	2.3%	3.7%	3.4%	2.8%	2.8%	3.2%	3.3%
HEV	2.3	3.1%	2.7%	2.1%	1.9%	2.1%	1.8%
BEV/PHEV	0%	0.6%	0.7%	0.7%	0.9%	1.1%	1.5%
Industry EV Model Count[21]	18	66	74	78	77	83	80

Figure 9: EV split between HEV and BEV/PHEV[22]

Worse still, there is every reason to think that the required redesigns will actually deter consumers from buying them because the added cost is significant and consumers are demanding other features in the low fuel price environment, which the Department of Energy forecasts will remain low through the timeframe of this rule. Applying this level of technology without the needed customer demand risks new vehicle sales, which would translate to significant production and employment losses for FCA.

It is difficult to overstate the importance of market acceptance of electrification in achieving future standards. FCA applauds the agencies for injecting better modeling that better acknowledges the levels of electrification needed to meet the augural standards.

Fuel Prices are Much Lower than Anticipated

The most significant change to the 2012 assumptions has been sustained, low gas prices. In the original regulation establishing MY2017-2025 standards, gas prices were predicted to be over $4 per gallon by 2018 while today's actual prices are under $3 per gallon. For the NPRM (see Figure 10), the agencies lowered their fuel price forecast through 2025 by 33% using Department of Energy Annual Energy Outlook Forecasts - a significant drop from the levels projected in 2012.

2015 - 2025 Predicted Average Price per Gallon of Fuel			
Fuel Prices Assumed in Current Rule (AEO 2012 Preliminary Report) **2016 $/gal**	**Updated Fuel Prices in SAFE NPRM (AEO 2017 Report)** **2016 $/gal**	**$/gal Difference**	**% Difference**
4.09	2.60	-1.49	36% Lower

Figure 10: Actual fuel prices have proven to be significantly lower than assumed in 2012 during development of the current rule.

Factors that impact gasoline prices include geo-political uncertainty, continued growth of new supply (e.g. shale oil), and fluctuations in worldwide demand.

[21] Minimum of one registration in CY; each EV type is a unique count

[22] Source: IHS Registrations through July 2018 excluding medium-duty, heavy-duty and bus.

So how do gasoline prices affect a consumer's willingness to pay for greater fuel economy? Long term sustained fuel price increases resulted in only a "modest" shift in customer acceptance of fuel saving technology, as described in the paper "How Do Gasoline Prices Affect Fleet Fuel Economy?[23]

> We find that gasoline prices have statistically significant effects... but that their combined effect results in only modest impacts on fleet fuel economy...Recall that record-high gasoline prices in 1970s only led to short-lived increases in fleet fuel economy and failed to induce any long-term solution such as fuel-saving technology innovations in the industry.

When gas is relatively inexpensive, fuel economy improvements save customers less money at the pump. Consumers in turn have less incentive to pay for expensive fuel saving technology, instead choosing to invest in other features or vehicle attributes – like a more capable powertrain, a better infotainment package, or other features. Relying solely on fuel price projections to assess a consumer's willingness to pay for fuel saving technology should be avoided.

UV market is growing at the same time as sedan/car market is decreasing

The last several years have witnessed a remarkable shift in consumer buying patterns away from more fuel efficient small and midsize passenger cars toward more capable crossovers and utility vehicles. Industry and regulators clearly did not anticipate this market shift in 2012. The forecasts referenced by the agencies at that time showed cars increasing from 50% to 57% of annual vehicle sales by 2025.[24]Instead, as shown in Figure 11, cars actually dropped to 30% of the total fleet by 2017 – the opposite of the expected trend. This has resulted in FCA along with other OEMs significantly adjusting product portfolios by reducing sedan capacity despite substantial investment.

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[23] Shanjun Li, Christopher Timmins, and Roger H. von Haefen, *How Do Gasoline Prices Affect Fleet Fuel Economy*?, AM. ECON. J.: ECON. POL'Y, p. 135 (2009).

[24] 77 Fed. Reg. 62680, Table II-2, October 15, 2012

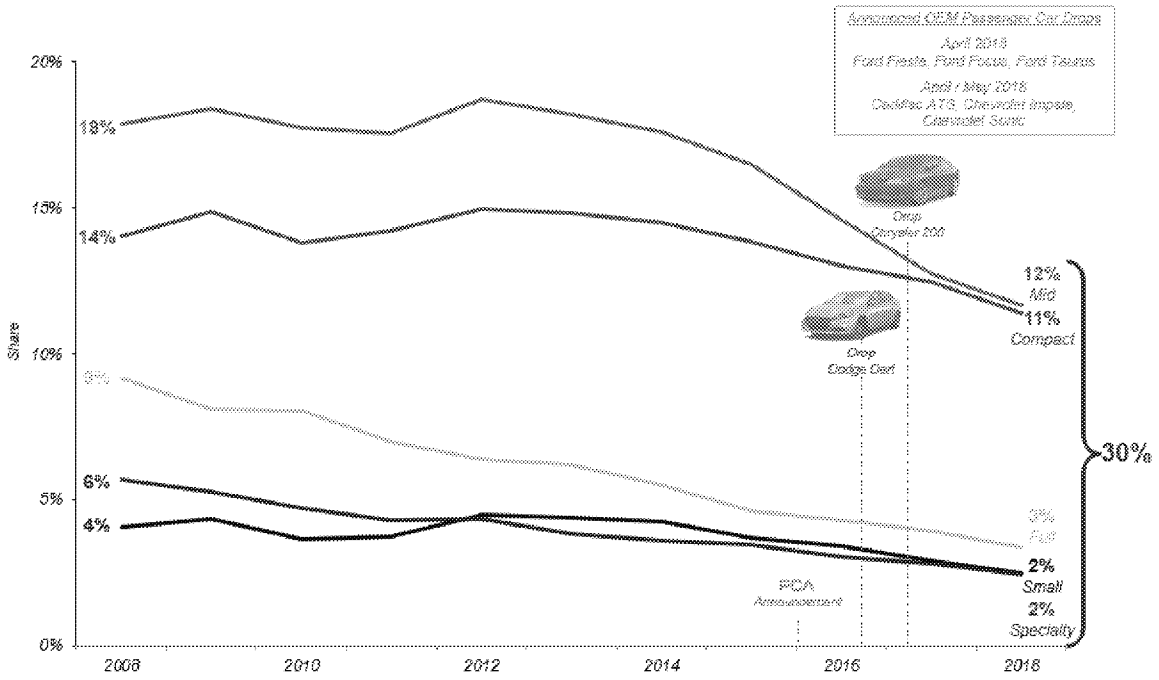


Figure 11: U.S. passenger car fleet has been shrinking since 2012 despite new product offerings[25]

Figure 12 shows that over the same period, the utility vehicle market share has grown to 47% directly displacing the drop in sedan volume. Figure 13 shows this growth spans the entire UV segment including small and mid-size UVs that can have similar footprints to sedans.

[25] Source: IHS Registrations through July 2018 excluding medium-duty, heavy-duty and bus.

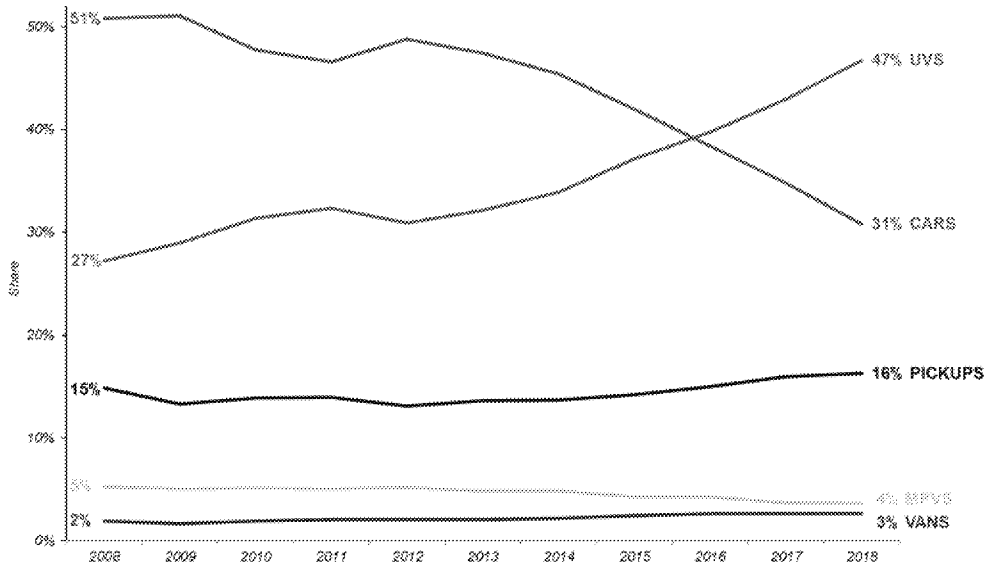


Figure 12: UVs are filling the gap of a shrinking car market [26]

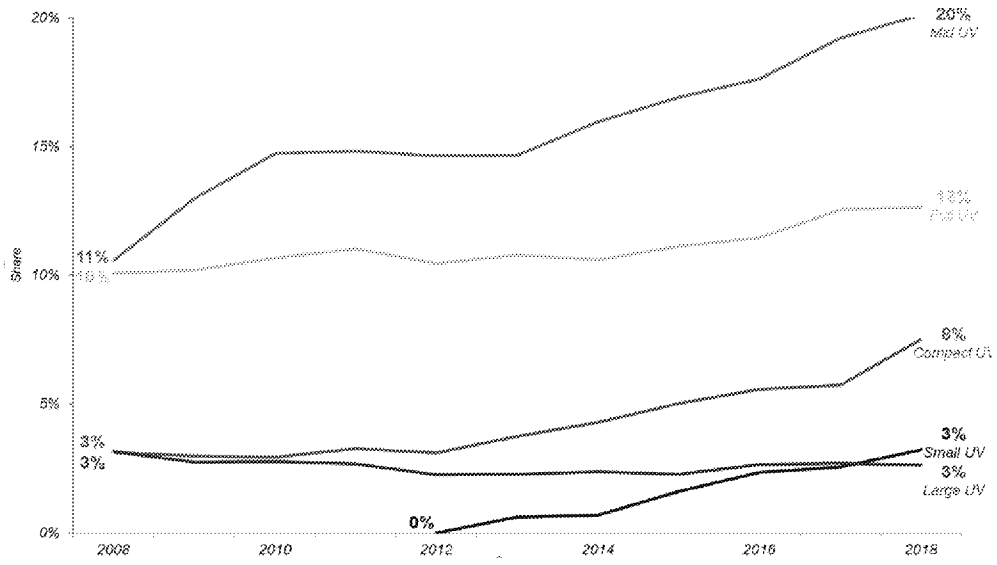


Figure 13: UV segment is growing across the size range with new smaller entries in the market.[27]

This shift in consumer preference presents a compliance problem, even in a footprint-based standards system. Figure 14 shows that a utility or crossover vehicle that has the same powertrain and technology as a sedan with the same footprint will generate 2-4 fewer mpg. In a world of low gas prices, that has proven to be a trade-off

[26] *Id.*
[27] *Id.*

that consumers are willing to make for the versatility of a crossover or SUV. Footprint-based standards do not account for this preference.

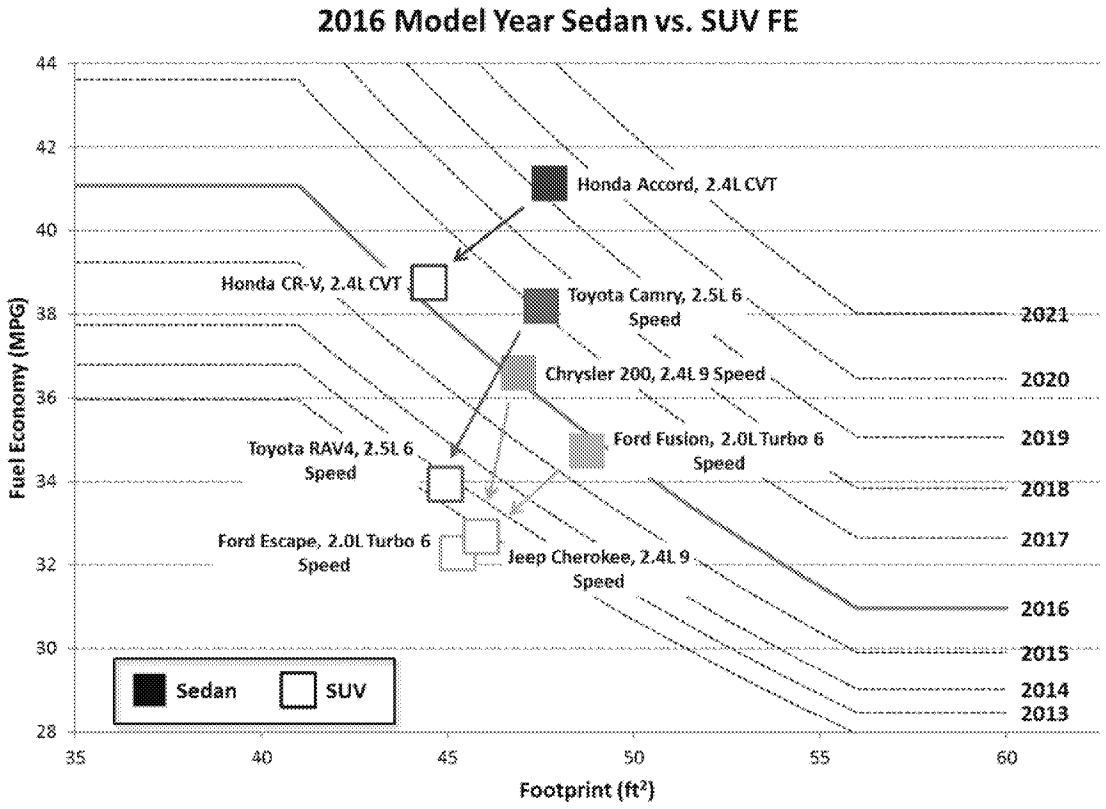


Figure 14: UVs can lose up to 4 mpg compared to sedans with the same footprint and powertrain technology [28]

FCA applauds the agencies for initiating the MTE process and rulemaking to evaluate seven years of actual market performance and update assumptions for a new rule going forward. The market shift away from sedans and towards UVs is one of the main contributing factors to the growing industry compliance gap that needs to be addressed. FCA asks the agencies to consider actions discussed further in these comments to address the UV market shift in a new rule.

Agency Safety Assumptions

In review of the NPRM and various industry data and research, FCA supports the agencies' conclusion that adjusting the current stringency of the CAFE/GHG regulation may have a positive impact on consumer safety.

As was indicated in the FCA comments to the Draft TAR and comments made by the Alliance, there is evidence that consumers will not rush to pay higher upfront costs for fuel savings technologies. Thus FCA agrees with the NPRM conclusions that this affordability impact of newer vehicles, equipped with not only improved fuel

[28] Footprint data from CAFE Model for 2018 NPRM for Model years 2021-2026 Passenger Cars and Light Trucks Central Analysis, 2018_NPRM_market_inputs_ref.xlsx, available at https://www.nhtsa.gov/corporate-average-fuel-economy/compliance-and-effects-modeling-system; Fuel Economy data from 2016 FE Guide for DOE-OK to release-no-sales-4-27-2017Mercedesforpublic.xlsx available at https://www.fueleconomy.gov/feg/download.shtml.

economy technologies but also the latest mandated and available optional safety technology, will not allow turnover of the fleet as the agencies originally predicted.

FCA supports the agencies' conclusions in the proposed rulemaking that consumers will be driving more, with annual vehicle miles traveled (VMT) rising as a result of improvements in fuel economy and the lower cost of operation, therefore exposing themselves to those inherent safety risks.

FCA is specifically concerned about:

Scrappage rates "The Jalopy Effect"

As FCA has previously commented to the agencies, vehicles on the road today are approaching a record average age of nearly 12 years (see Figure 15). As the cost of new technologies exceeds what customers are willing to pay, this average vehicle age may increase as consumers decide to hold onto their current vehicles longer or purchase from the used vehicle market. In either case, the benefits of safer, cleaner, and more fuel-efficient vehicles are not realized as intended under the Augural standards. The agencies acknowledged the risk of an aging fleet in the Draft TAR, and FCA supports their latest concerns in this rulemaking as they now assess the possible safety impacts of that outcome.

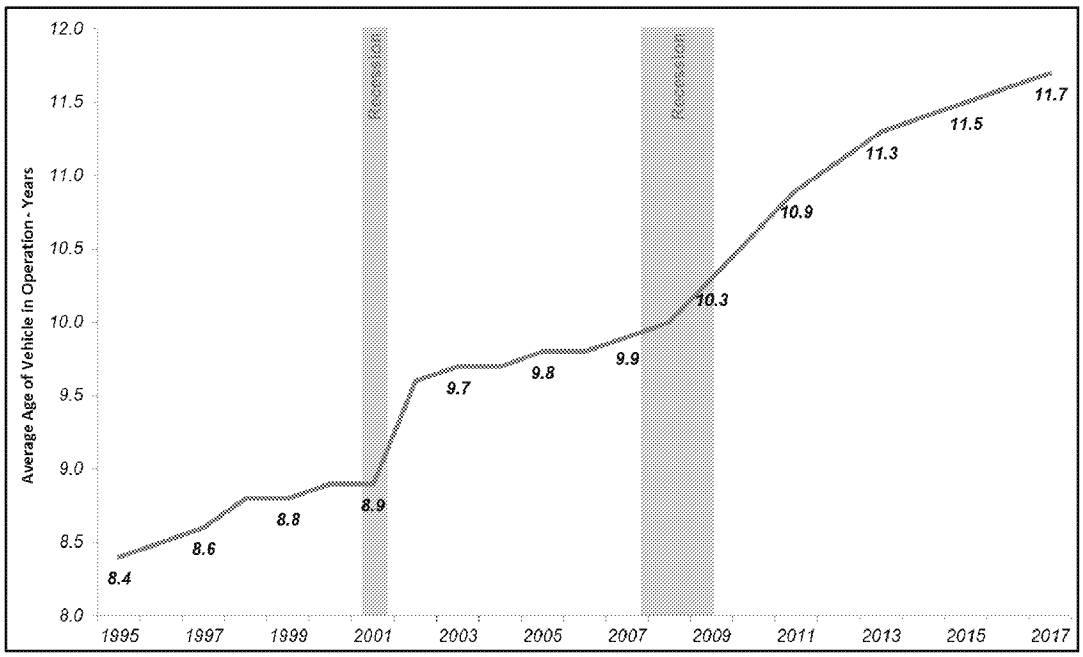


Figure 15 - Average age of vehicles on the road for new and used car buyers.[29]

FCA is extremely concerned that the higher levels of technology, especially electrification required by the levels in the current augural standards, will result in additional price increases for vehicles, further raising concerns about affordability of new cars and trucks for many consumers.

[29] Source: IHS Registrations through 2017 excluding medium-duty, heavy-duty and bus. Used age is additive to new car age.

As stated before, FCA believes consumers are already stretching their ability to afford new vehicles for the following reasons:

- Income growth for many consumers remains stagnant.
- Loan rates are projected to rise from historic lows, while loan durations continue to lengthen.
- Vehicle prices continue to rise due to increasing levels of technology and regulatory requirements.

FCA agrees with the agencies concerns that an outcome of the current augural stringency of the CAFE/GHG emission regulations may be a decreasing trend in vehicle scrappage rates as consumers delay purchases. This is primarily due to the increasing new vehicle costs of fuel economy technologies mandated to be equipped on newer vehicles. This drop in scrappage rates will thereby force consumers to hold their current vehicles for additional time, affecting the fleet turnover assumptions made during the development of the augural standards. In addition, it therefore corresponds that increased scrappage under alternative scenarios removes these older vehicles from the overall fleet and removes the mileage driven by these less safe cars.

The agencies should continue to consider the impact that increased vehicle age could have on societal goals, including:

- Loss of environmental benefits as older, higher-emitting vehicles remain on the road longer and are not replaced with newer low-emitting vehicles.
- Delayed roll-out of advanced passive and active safety features such as improved crashworthiness technologies, driver assist systems and emerging connected vehicle-to-vehicle technologies.
- Reduced access to automated driving features.

Keeping these older, less safe vehicles on the road longer will add fatality risks to the consumer. FCA supports the agencies' conclusions in the NPRM. Lives could be impacted by not only lower sales of newer safer vehicles but also lower scrappage rates of older, less safe vehicles.

FCA Recommendation:

FCA agrees that NHTSA and EPA must consider the improvement in consumer safety that could be impacted by delayed fleet turnover when considering the stringency of the CAFE/GHG emissions standards. Commitment to ONP to ensure the improvement in fuel economy to the entire fleet without the detriment of less safety technology must continue to be the goal.

Rebound VMT effect

The current CAFE/GHG regulations were developed with an expectation of high gas prices but are now operative in a period of sustained low gas prices, strongly impacting payback (and consumer choice). Considering these lower gas prices, combined with a vehicle fleet that has increased fuel efficiency, we support the agencies' conclusions that the consumer will most likely make the economic choice to drive more, i.e., VMT will increase.

FCA's review of the NPRM data and available independent studies show that this average increase of approximately 20% more VMT selected by the agencies is a reasonable outcome once vehicles are achieving higher fuel efficiency under the augural stringency. This review showed that all of the alternative scenarios in the NPRM result in fewer VMT than the current augural standards will achieve. This relationship between VMT and fatalities is a well-established criteria as cited in 2016 by the U.S. Department of Transportation's traffic

crash data publication of 11.8 fatalities per billion additional VMT for that specific model year. Thus, this 'rebound' effect of additional VMT under the Augural levels will increase exposure of the consumer to possible fatal injuries.

FCA agrees with the regression-based model that NHTSA used in the NPRM for yearly projection of these VMT effects on fatalities as a supportable and reasonable method. Therefore, the cumulative impact of additional VMT by consumers due to the lower cost per mile economics under the augural standards, will add thousands of fatality risks, as indicated by the agencies in the SAFE NPRM.

FCA Recommendation:

FCA agrees with the agencies concern that the current CAFE/GHG regulations may cause increased VMT and an associated impact on consumer safety. Therefore, the SAFE rulemaking must take into account the possibility of reductions in consumer fatalities when adjusting the fuel economy targets.

Lower vehicle mass impacts

FCA supports the NPRM conclusions that transitional changes in vehicle mass made to reduce fuel consumption could negatively affect consumer safety. At the 2011 and 2013 NHTSA-hosted workshops on vehicle mass, size and safety, NHTSA heard from a wide variety of experts, including FCA's G. Nusholtz about the close physics-based relationship between mass and safety fatalities. Mr. Nusholtz used crash physics (closing speed, estimates of inelastic stiffness, and energy absorption) to estimate changes in fleet safety risk as a function of changes in these parameters and indicated that mass is a dominant factor in that risk.

In addition, FCA reminds the agencies that the 2015 NAS Committee also acknowledged the possibility of negative safety effects during the transition period because of variances in how mass reductions occurred.

FCA Recommendation:

FCA agrees with the agencies statements in the NPRM that the SAFE rulemaking must take into account the possible safety risks associated with the vehicle mass reduction variances that are associated with the current augural CAFE/GHG standards stringency levels.

2. FCA Recommended Change to Regulation

Primary Actions: Adjust Footprint Curves and Provide ATV Multipliers

Need to Make Assumptions and Set Targets for Future Improvement

Forecasting achievable CAFE/GHG levels must consider input from all stakeholders - industry, government and consumers - to realize the desired results. Progress is measured using environmental, energy security, safety and the economic metrics. Achieving long term goals is made difficult due to the pure magnitude of the challenge and the complex, intertwined uncertainties involved. Assumptions about the uncertainties need to be made so that a path forward with realistic targets can be established. Without achievable targets, there is nothing to work towards nor is there a means to assess progress. Making assumptions and setting targets is an essential part of achieving the long-term challenge of improving GHG and fuel economy. That was the goal of the ONP – collecting all stakeholder input and setting a path forward for progress.

Re-Assess Performance to Target Along the Way – the Reason for the Mid Term Evaluation

The more uncertainties there are, the more assumptions are needed, increasing the likelihood that some of those assumptions will prove incorrect. Projections of CAFE/GHG improvements have no shortage of these uncertainties. Fuel prices, market acceptance of disruptive technologies like electrification, technology costs and benefits, consumer demands, and affordability represent just a portion of the complex web of uncertainties that significantly impact the rate at which the overall fleet can improve.

In 2012 these factors were studied, and assumptions were made about conditions thirteen years into the future so that long-term targets could be established. It should come as no surprise, and in fact, we now know that some of the assumptions underpinning the plan set forth thirteen years in advance were not correct. Fuel prices have remained much lower than expected, making it hard for rational customers to justify the cost of expensive fuel saving technologies. Customers are choosing larger, more capable UVs with characteristics that are not fully captured by footprint metrics, and most significantly consumers are not adopting electrification. The market for electric vehicles, the continued growth of which is essential for reaching the CAFE/GHG targets previously set, has remained stagnant, and is nowhere near the levels needed to meet the current targets.

This is precisely the reason the original rule put in place an MTE mechanism, to address differences between forecast and actual performance and set future targets based on updated assumptions. In 2012, all parties recognized the importance of setting long-term fuel economy and GHG targets to achieve long-term success. It was also understood that due to the uncertainty of these assumptions, an MTE was needed half-way through the thirteen-year plan in order to evaluate progress and update the assumption and targets accordingly. That evaluation has been completed, and this comment response details many of the assumptions underlying the original thirteen-year plan that have proven to be incorrect.

Actual Performance and Corrected Assumptions Should be the Baseline for Future Improvements

The only meaningful measure of how the industry, the agencies, and the market have progressed towards the shared goal of GHG emissions reductions and fuel economy improvement is actual performance of the U.S. fleet that has been realized to date. Actual performance of the vehicle fleet crystalizes all uncertainties into a single, indisputable metric immune to opinion or politics. It represents what the market is accepting, the costs realized and the performance achieved – without question. It allows all parties to agree on a factual baseline from which a new path forward can be established. Actual fleet performance seven years into a thirteen-year plan is the most important and valuable metric agencies can and should reference in order to establish what the new plan should be moving forward.

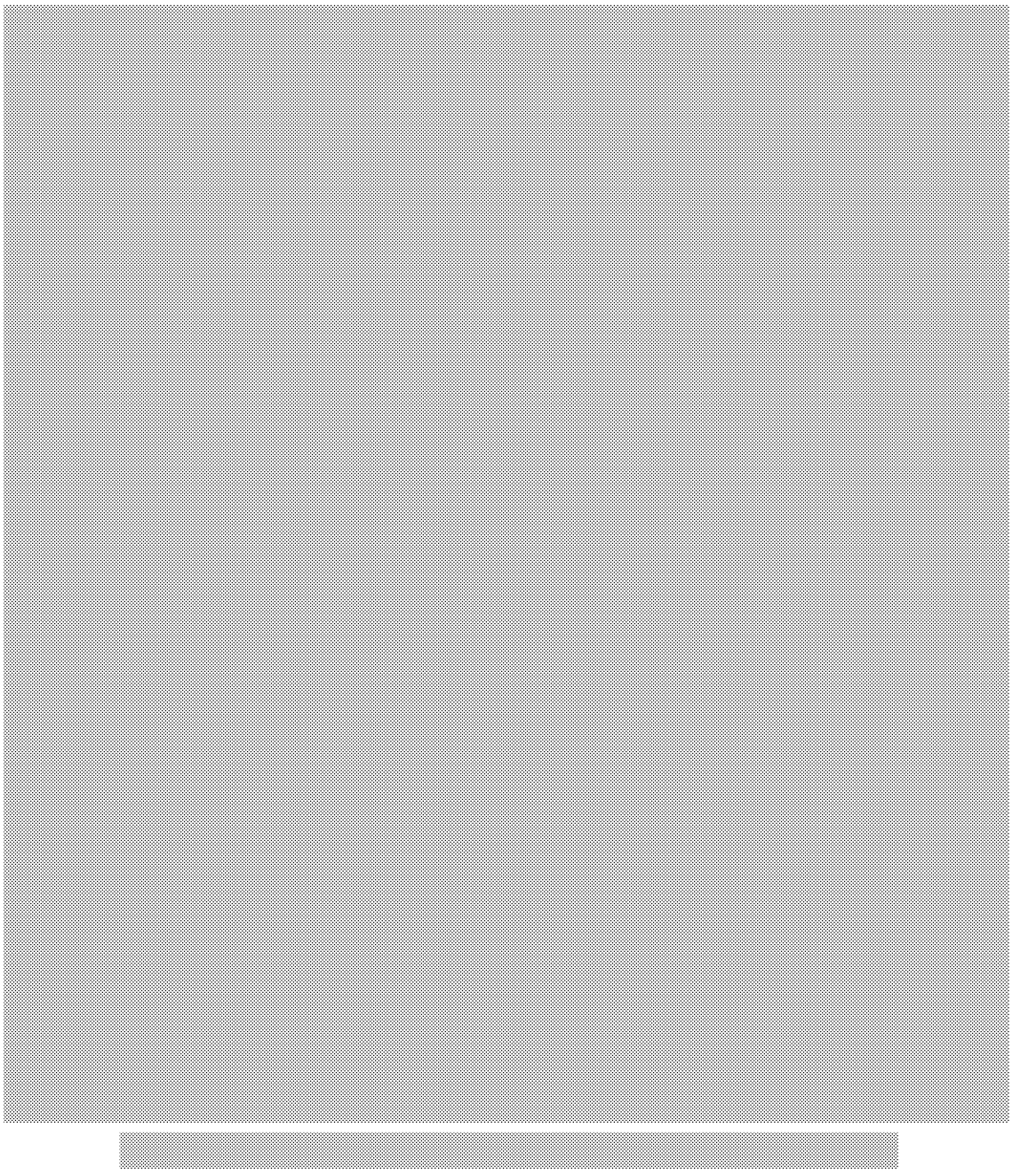
Grounding a new plan on targets set in 2012 compromises the validity of any future targets by re-embedding the incorrect assumptions of the past into the new path forward, undermining the purpose of the MTE. By failing to recognize actual performance as the starting point for which to apply new assumptions, the agencies ignore the clarity seven years of reality can provide in understanding the complex uncertainties of fuel economy improvement and GHG emissions reduction.

The agencies must establish new targets for fuel economy improvement and GHG reduction through MY2026 starting from what has actually been achieved by industry and the market using the latest data for new assumptions. While FCA and other OEMs are committed to continued fuel economy improvements, the agencies have to hit the reset button for the MY2020 starting point and acknowledge and account for the MY2018 industry gap of roughly 3 mpg in MY2020, the starting point of the revised regulation. This starting point gap to standards was not overtly acknowledged by any of the alternatives in the NPRM.

FCA Performance is Improving at an unprecedented rate – but not at the levels assumed in 2012

FCA, like of the rest of the industry, has been striving to achieve the current fuel economy standard by deploying technology throughout our product lines. Some highlights at FCA include: our new family of downsized and boosted direct injection engines; implementation of wide-ratio 8 and 9 speed transmissions; the class leading Pacifica Plug-in Hybrid Electric Minivan; the introduction of 48V mild hybrids on V6 and V8 Ram Pickups; the application of stop-start technology across multiple products; and our announcement of a Plug-in Hybrid Electric Jeep Wrangler.

This unprecedented application of technology is captured in Figure 16, which highlights improvements across FCA products.



Since 2014, FCA has achieved about a 15 percent improvement in CO_2 across many of our most popular products.

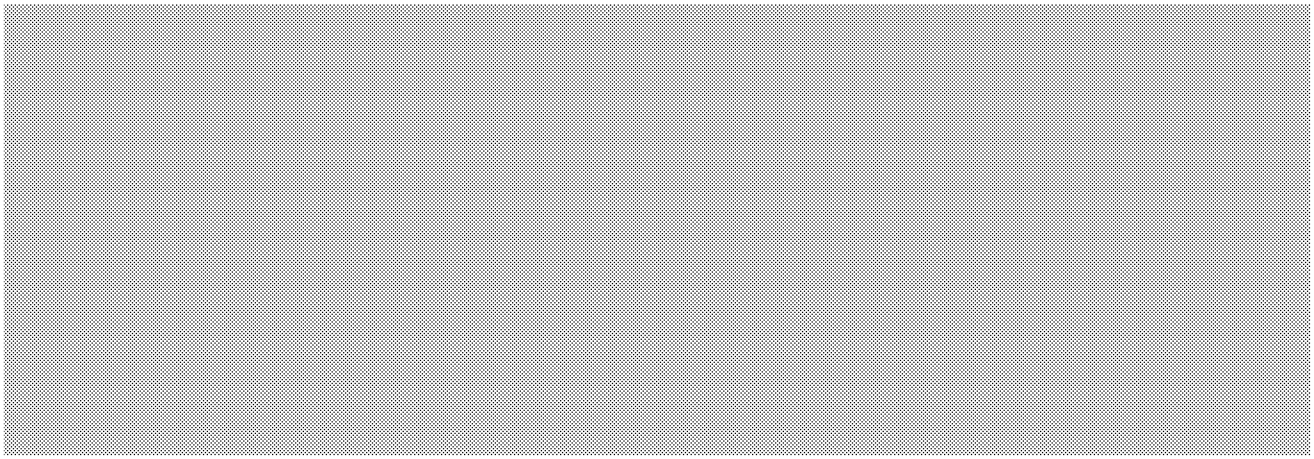


Figure 17: FCA has applied technology significantly improving CAFE/GHG performance across all product lines

With actions like these, FCA and the industry have established a rate of improvement unprecedented in history. Figure 18 uses a weight normalized metric based on EPA's Fuel Economy Trends report data without credits to compare various improvement rates for industry since 1975. It has to be normalized otherwise a clear trend cannot be discussed over long periods of time. In the period since 2012 and under the current regulation, the industry GHG is improving at a rate never before achieved and about 1.5 times faster than historical trends. It is important to note that this period between MY2012 and MY2016 included FFV credit, Federal BEV/PHEV Tax Credits, and maximum refrigerant credits, which are all either no longer available or cap constrained going forward.

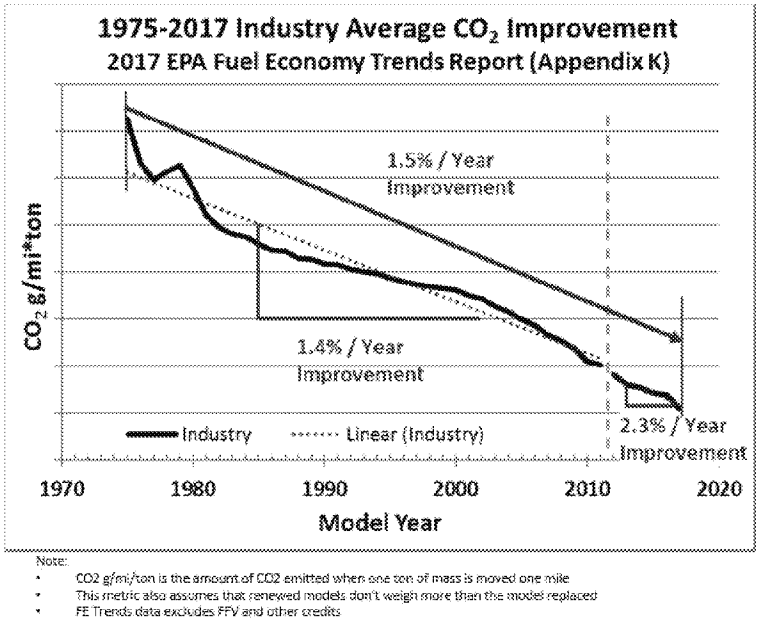


Figure 18: Industry has been improving at an unprecedented rate since 2012 under the current rule.[30]

Despite these significant and continued product improvements, FCA and the rest of the industry are falling short of current standards and are using banked credits to close the compliance gap.

[30] U.S. Environmental Protection Agency, "Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2017," EPA-420-R-18-001, Appendix K (January 2018). (EPA 2017 FE Trends Report)

Figure 19 shows that in the period between 2012 and 2018, under the current rule and increased agency pressure to improve, FCA achieved fleet performance improvement totaling 2.4 mpg in CAFE and 29 g/mi in GHG emissions reductions. On average FCA achieved a 0.4 mpg per year improvement in CAFE and 4.8 g/mi per year in GHG emissions reductions. However, during this same period the standard required FCA to improve by 0.7 mpg per year in CAFE and 8.5 g/mi in GHG per year - demanding a rate of improvement that, on average, is more than 70% greater than FCA can achieve.

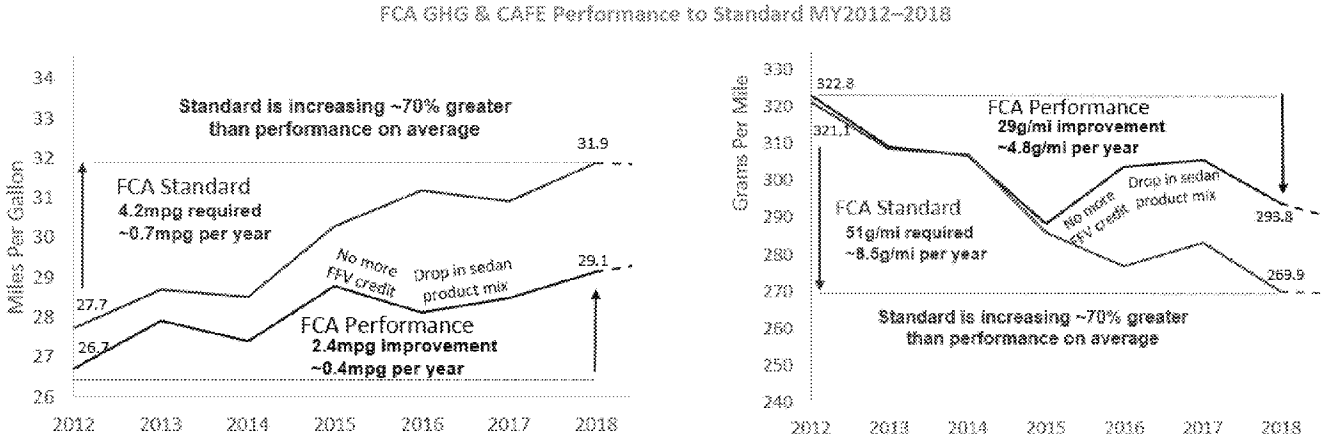


Figure 19: MY2012–2018 shows the current standard outpacing FCA improvement. [31]

The story is the same industry wide. Figure 20 shows that since MY2012 and projected through MY2018, the industry achieved on average a 0.6 mpg per year improvement in CAFE and a 4.7 g/mi improvement in GHG emissions reductions. However, the current standard demands, on average, improvement rates of 0.9 mpg per year and 8 g/mi per year – 50% to 70% greater than industry can achieve even under the pressures of the current regulation. Put simply – the standards for both FCA and industry are increasing far faster than performance can improve given current market conditions.

[31] MY2012–2016 FCA performance data from EPA 2016 GHG Performance Report. MY2017–2018 data from FCA internal compliance plan. All data represents performance before the application of industry credits

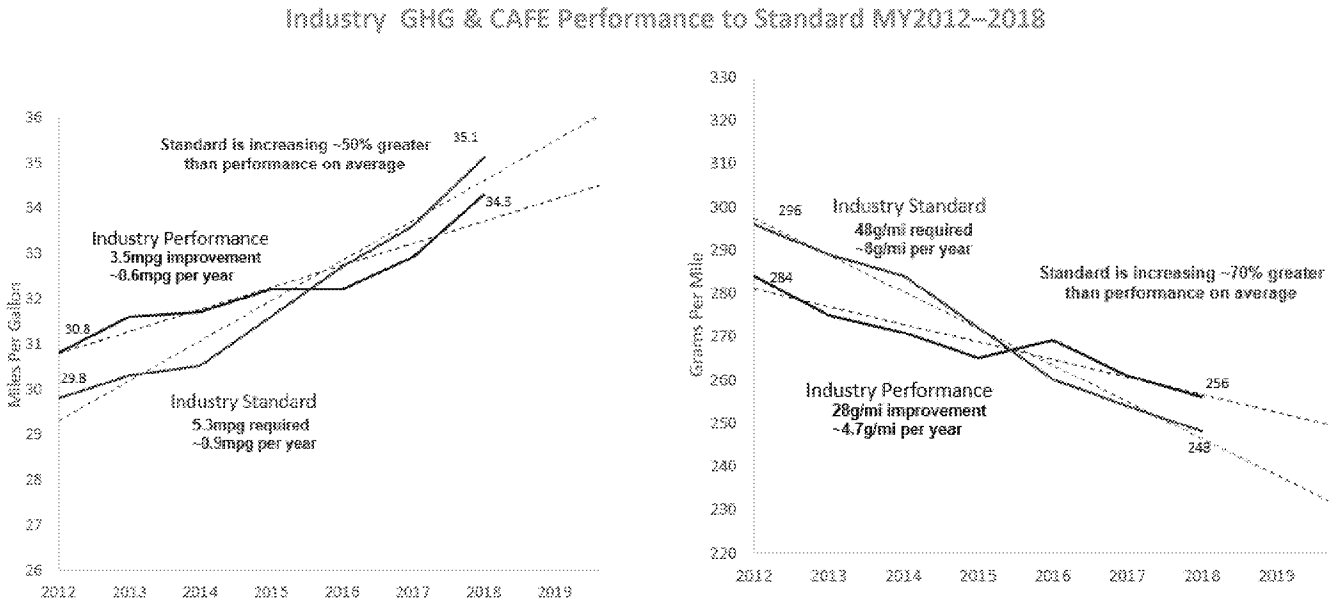


Figure 20: MY2012-2018 shows the current standard outpacing industry improvement.[32]

FCA will continue with an unprecedented improvement rate and work towards [redacted] PHEV/BEV electrification.

As previously discussed, one of the critical assumptions that enables the above projected performance for FCA is the amount of electrification the market accepts in future years through MY2026. Today's market take rate of PHEV/BEV/FCV products is relatively flat at around 1.5%, with HEV sales actually declining as some potential HEV customers shift to PHEV/BEV technology.

Recent data also shows that electrified vehicles are the only products currently capable of reaching the augural CAFE/GHG standards. This presents regulators, OEMs and the market with a conflict - the only technologies available that reach the desired target are not being accepted by market in needed quantities because of cost/affordability concerns, and other challenges in this timeframe.

Despite this challenging outlook, manufacturers are developing and offering PHEV/BEV products that have captured a 1.5% market share seen today. Regulatory and financial incentives have helped. ATV multipliers and the federal $7,500 tax credit improve the market favorability and thereby the compliance benefits of PHEV/BEV products which in turn amplify the justification for product investment and development. Without these incentive programs PHEV/BEV product investment would have to stand on its own and would be difficult to rationalize with its small 1.5% market footing and sales of ~300,000 units per year in a market in excess of 17 million vehicles. Add to that the upfront cost increases of a PHEV/BEV over a traditional ICE vehicle and poor residuals – costs which customers have yet to demonstrate a willingness to pay for, or afford – and OEMs end up with a nearly impossible business case justifying development of new PHEV/BEV products.

[redacted]

[32] MY2012–2016 Industry performance data from EPA 2016 GHG Performance Report before the application of industry credits. MY2017–2018 Industry data from Novation Analytics 2018 Baseline Study.

[redacted]

[redacted]

Unprecedented improvement and a tripling of PHEV/BEV take rate is not enough to close a MY2020 compliance gap before MY2025.

FCA agrees with the agency position that the current augural standards are not appropriate. While industry and FCA continue to improve, that improvement is at a slower ramp rate than assumed by the current regulations. In MY2016, for the first time since the new standards were promulgated, industry on average needed banked credits to comply. This gap to standard continues through MY2018.

The current NPRM only covers the MY2021 through the MY2026Y period. Therefore, the standards for MY2018 through MY2020 will not change. We have a good understanding of industry ramp rate versus augural ramp

[redacted]

[redacted]

It is important to realize that manufacturers will begin producing MY2020 products in less than three months (January 2, 2019) from now. Performance "step changes" in FCA's 2-million unit fleet is not realistic, recognizing the overlap of product renewals – that is, there are no actions available to extinguish the MY2020 gap.

[33] FCA performance based on published data from the EPA 2016 GHG Performance Report. MY2017–2025 performance projections based on FCA's internal compliance plan. All data represents performance before the application of industry credits.

tail later in this section.

Industry credits will not be available to cover compliance gaps past MY2021

Credit trading is an external fleet credit flexibility allowed by regulation that compliments other internal credit flexibilities: (1) carry forward credits, (2) carry back credits, or (3) transferring credits between fleets. All of these mechanisms encourage an OEM to identify and invest in the most cost efficient, customer-facing approach to greenhouse gas or fuel economy improvement. Credit trading is discussed in detail in section 5.

Through the MY2014, the industry on average was over-compliant to the standards resulting in the industry earning credits that could be "banked" for the future. Again, for the first time in MY2016, industry shifted to a deficit position needing to withdraw from the 'bank' of credits in order to comply. As the standards continues to increase at rates that outpace the rate of improvement of industry, this "credit burn" situation will continue

This gap forces industry to use more and more banked credits in order to comply with yearly requirements. Figure 22 below illustrates that in MY2016 industry had a 250 Tg credit bank. This bank is projected to erode to less than 100 Tg by the MY2019 and be completely consumed by MY2020 before the MY2021-2026 rule is even implemented

Independent third party sources agree that the industry credit banks will be consumed by the MY2021 [34],[35]meaning that OEMs on average will need to meet any new MY2021 standard without the availability of banked credits – this is not possible given the current performance gap to the current standard. It is important to note that these third party forecasts of industry credit bank depletion by MY2020 assumes perfect trading amongst industry. In reality, manufacturers are not required by regulation to sell credits and therefore it will be a business decision per manufacturer to trade or not. If manufacturers decide to retain credits rather than trade, the compliance position for industry degrades even further than outlined above and shown below.

[34] Novation Analytics Model Years 2012 to 2018 Baseline Studies (Version 1.1), Novation Analytics – October 2018

[35] Redburn European Autos Fresh Air, Redburn Research – September 2018

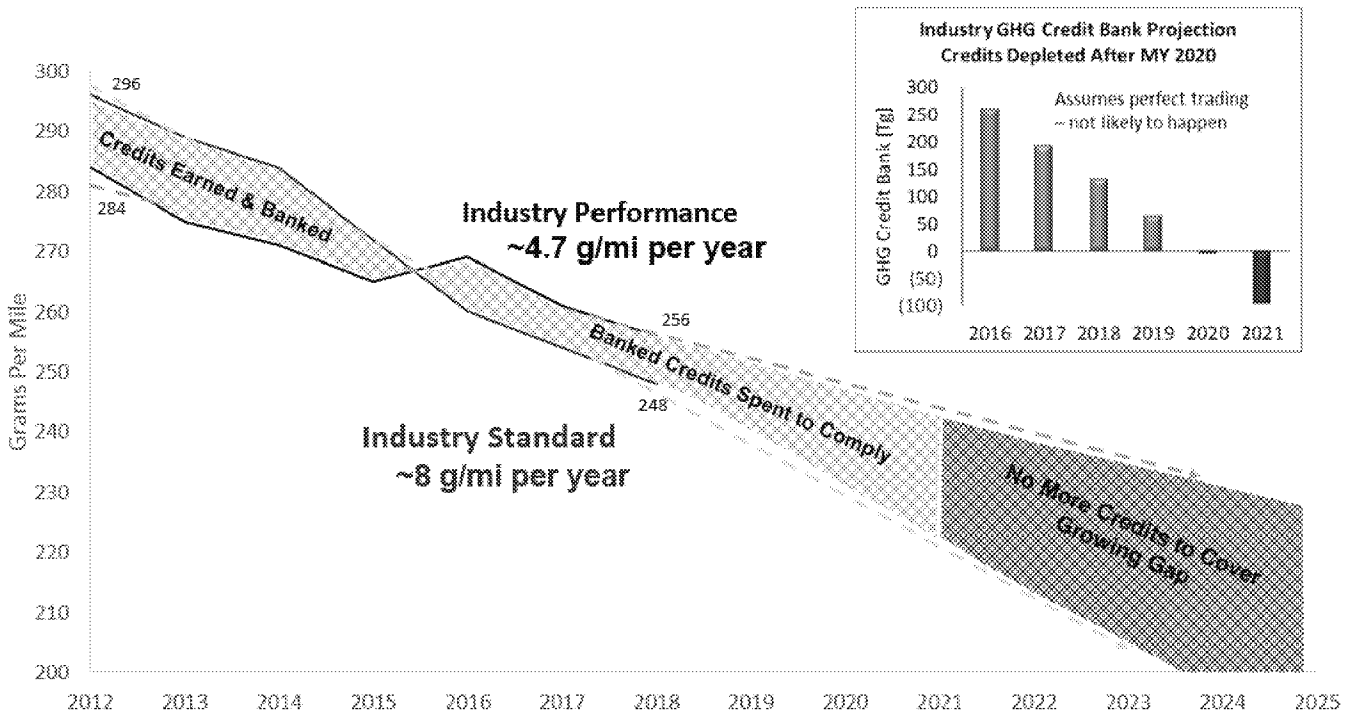
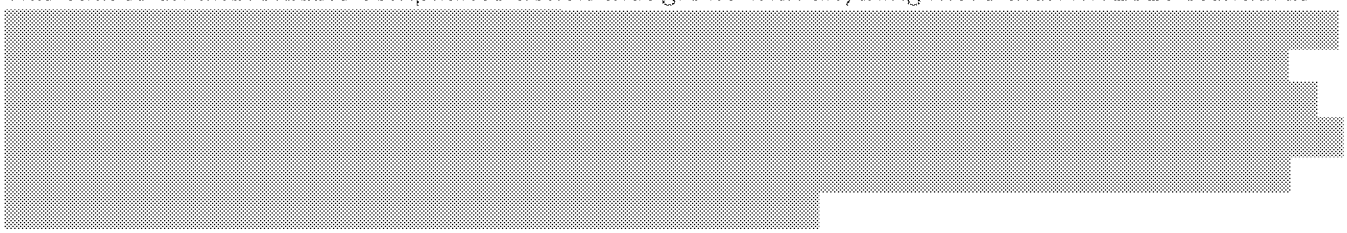


Figure 22: Standard is diverging from industry performance consuming banked credits, creating unsustainable gap past 2021.[36]

This causes an unavoidable compliance deficit that grows with anything more than MY2020 standards



[36] Based on published industry performance and standards through MY2018 projected linearly to illustrate diverging trend. MY2016 credit bank data from 2016 EPA GHG Performance Report. VPaC volumes and forecast performance/standards were used to calculate fleet credit bank each year.

If standards increase from MY2020 levels, the situation worsens for FCA and industry without some significant form of offset or flexibility

Extended and expanded ATV Multipliers are needed to even partially address gap

Overall compliance is a function of vehicle performance, regulatory standards and regulatory flexibilities. Flexibilities can be in the form of an incentive to promote an agency policy direction or recognize an on-road benefit not captured during laboratory test conditions. As such, flexibilities are an important compliment to any compliance requirement.

Figure 24 details the BEV/PHEV sales multipliers that act as regulatory incentives in the current regulation. A multiplier of two means manufactures that sell 1 BEV can count it as 2 for compliance measurement.

EV Multipliers in the Current Regulation Phasing out in 2022MY

	2018	2019	2020	2021	2022
BEV	2.0	2.0	1.75	1.5	1.0
PHEV	1.6	1.6	1.45	1.45	1.0

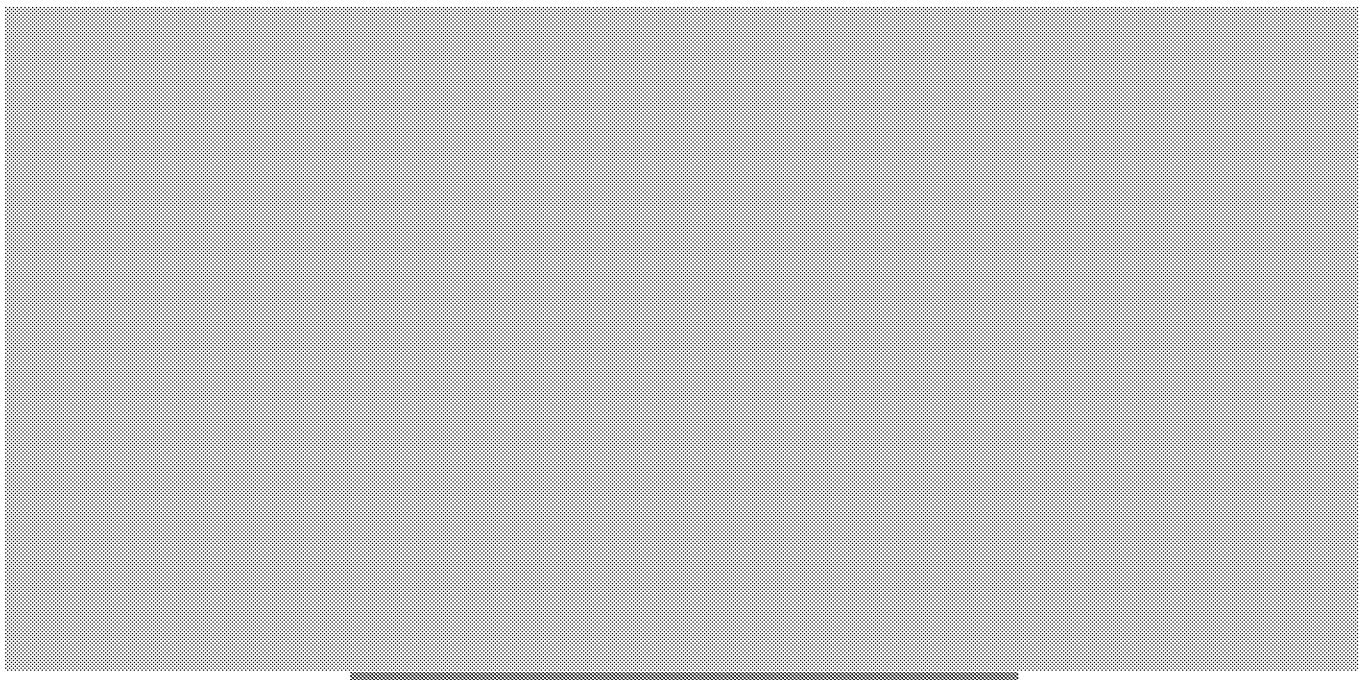
Figure 24: BEV/PHEV multipliers will phase out with the current regulation

[37] Based on published FCA performance and standards through MY2016 and internal FCA compliance plans through MY2025. Net industry credit projections based credit bank data from 2016 EPA GHG Performance Report and VPaC volume forecasts.

As FCA and industry have noted in previous formal comments to the agencies, electrification is an important

Figure 24 also shows how ATV multipliers start to phase out in MY2019 and are completely gone by MY2022 in the current rule. This phase out degrades FCA's compliance plan by reducing the impact of PHEV/BEV products and further hampering continued BEV/PHEV investment.

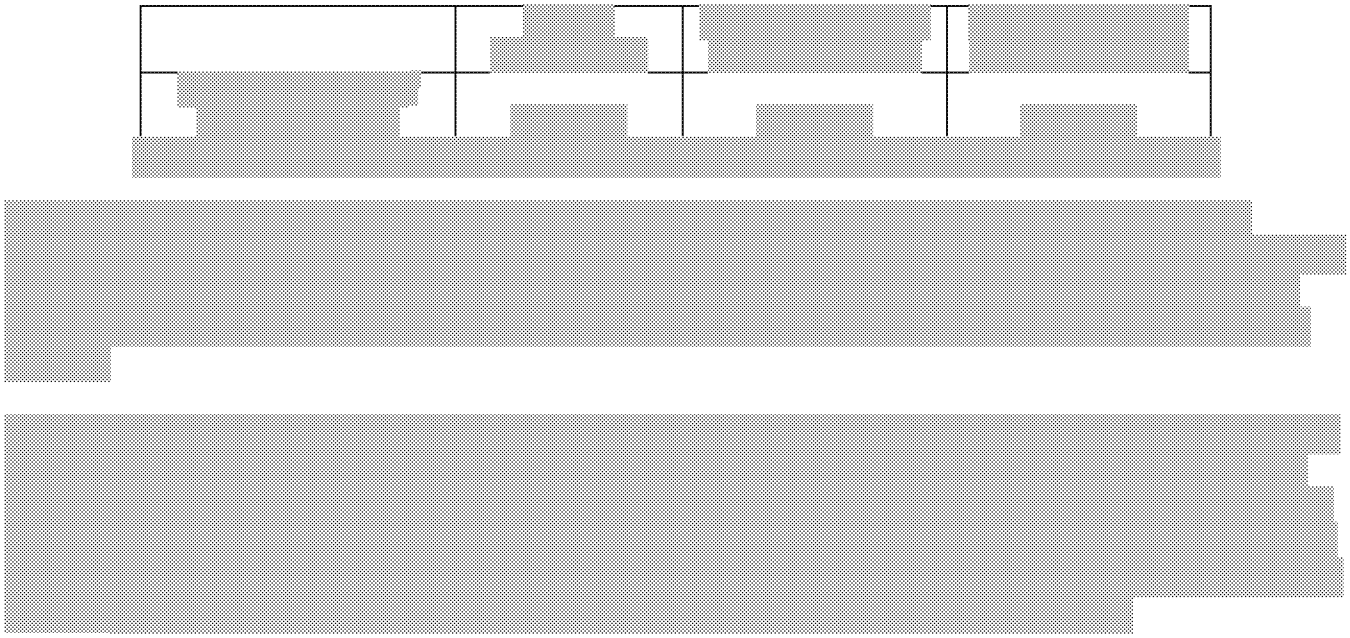
FCA believes it is too early to remove the multipliers given all the challenges slowing a stronger uptake of PHEV/BEV technology. FCA believes the agencies should at least double the ATV multipliers and extend their availability without degradation through MY2026 to help promote the agencies' policy objectives.



BEV / PHEV Multiplier		
Today	Doubled	4x-5x
BEV 2.0 PHEV 1.6 (Phased out by MY21)	BEV 4.0 PHEV 3.2 (Extended to MY25)	BEV 8.0 – 10.0 PHEV 6.4 – 8.0 (Extended to MY25)

Extending and expanding ATV multipliers would partially help FCA recoup the deficit caused by the current

[38] Impact of extended and expanded EV multipliers from FCA internal compliance plan



The analysis above demonstrates the two-fold benefits of expanding ATV multipliers. They incentivize the needed market growth of BEV/PHEV products for compliance while helping to address the depleted credit bank risk.

It is critical for the agencies to acknowledge the size of the compliance gap and the time it takes FCA to recover is directly influenced by how agencies set MY2021-2026 standards and flexibilities. FCA requests that the agencies set any new standards so that recovery of the compliance gap is achieved prior to MY2022, the point in time when the availability of industry credits becomes uncertain.

Proposal for Advanced Technology Vehicle Incentive Multipliers (PHEV, BEV, and FCEV)

The NPRM (83 Fed. Reg. 43461) seeks comment on extending and expanding the use of advanced technology vehicle (ATV) multipliers. Specifically, the NPRM requests comment on multipliers ranging from 2.0 to 4.5.

The Alliance supports extending the use of ATV multipliers past MY2021and increasing them to 4.5 as soon as is possible.

CARB commented in EPA's Phase 2 Heavy Duty NPRM that "multipliers were not widely used [in Phase 1] because they were insufficient to address the costs and risks inherent in developing new technology".[39] In the same comments, CARB demonstrated a method of calculating an appropriate technology multiplier based on the cost/benefit of advanced technology vs. the cost/benefit of conventional technology. CARB's equation is shown here:

$$Incentive\ Multiplier = Adjustment\ Factor\ x\ \frac{\left(Adv.Tech.Cost/_{Adv.Tech.Benefit}\right)}{\left(Conv.Tech.Cost/_{Conv.Tech.Benefit}\right)}$$

[39] Comment submitted by Michael Carter, Assistant Division Chief, Mobil Source Control Division, California Air Resources Board (CARB), https://www.regulations.gov/document?D=EPA-HQ-OAR-2014-0827-1968

For example, one of the cases considered in CARB's comments was for class 2B/3 trucks. In their analysis, the incremental cost for a class 2B/3 BEV was $25,000 which would eliminate 545 g/mi of emissions. The conventional technology would cost $1,340 and reduce emissions by 87 g/mi. The cost-benefit ratios are then ($25,000/545 g/mi)/($1,340/87 g/mi) = 3.0.

The final, recommended incentive multiplier for BEVs was 4.5, which implies an adjustment factor of 1.5. CARB proposed incentive multipliers higher than the calculated cost ratios noting that "A multiplier that exactly balanced the additional cost would be less likely to incentivize technology development."

Applying CARB's method to light duty vehicles, the Alliance proposes the following analysis using numbers from the GHG analysis from the Volpe model. The average vehicle emits 258.8 g/mi in MY2016[40]. This would be reduced to zero with a battery electric powertrain at a cost of $20,791 in MY2021[41]. Conventional technology would reduce CO_2 emissions by 61.3 g/mi at a cost of $1,659[42]. As seen in the equation below, using the same 1.5 adjustment factor that CARB used for class 2B/3 trucks yields an ATV multiplier of 4.5:

$$Light\ Duty\ BEV\ Incentive\ Multiplier = 1.5\ x\ \frac{\left(\$20{,}791/258.8\ g/mi\right)}{\left(\$1{,}659/61.3\ g/mi\right)} = \mathbf{4.5}$$

Note that while the Alliance continues to advocate for eliminating the burden of upstream emissions, this calculated multiplier would be much higher if upstream emissions were applied. The benefit of the BEV might be reduced by 100 g/mi, which in turn would cause the calculated multiplier in this example to increase to 7.3.

The same analysis can be performed with PHEV systems. In spite of their reduced battery costs, having two powertrains makes PHEVs nearly as expensive as BEVs with a powertrain cost of $15,554[43] resulting in a CO_2 reduction of 181.1 g/mi for an average vehicle.[44] The reduced benefit means the process yields an even higher ATV multiplier for PHEVs than for BEVs of 4.8:

$$Light\ Duty\ PHEV\ Incentive\ Multiplier = 1.5\ x\ \frac{\left(\$15{,}554/181.1\ g/mi\right)}{\left(\$1{,}659/61.3\ g/mi\right)} = \mathbf{4.8}$$

While pure electric vehicles may be the preferred long-term solution, incentivizing PHEVs makes sense until such time that range anxiety can be resolved with a significantly increased number of plug-in vehicle charging stations.

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[40] Baseline CO_2, Conventional Technology Costs, and Conventional Technology Benefits from compliance_report.csv from CO_2 central analysis, augural standard scenario, all vehicle classes, all manufacturers

[41] Preliminary Regulatory Impact Analysis, Battery Costs from Table 6-29, Learning Curve Schedules from Table 9-94, Electrification Technology Costs from Tables 6-32 and 6-33.

[42] Difference between all vehicle, all manufacturer CO_2 and technology cost in MYs 2021 and 2016. Augural standard scenario from CO_2 central analysis

[43] Preliminary Regulatory Impact Analysis, Battery Costs from Table 6-29, Learning Curve Schedules from Table 9-94, Electrification Technology Costs from Tables 6-32 and 6-33.

[44] Assumed benefit of 181.1 g/mi is 70% of the baseline 258.8 g/mi for a PHEV50.

One of the main drivers of this incentive multiplier math is the battery cost. Like the agencies, FCA expects that the cost of batteries will continue to decline but the rate at which prices will drop is very much an open question. FCA agrees with the concept of a multiplier that scales based on market realities such as the changes in battery costs determined through independent analysis. If costs remain high, the multipliers should also remain high and stay in place for a longer period of time. If costs drop faster than expected, the multipliers and the duration can be appropriately reduced.

The Alliance also requests that NHTSA consider using ATV multipliers in the CAFE program. Notwithstanding previous comments from NHTSA that EPCA/EISA precludes the agency from using incentive multipliers[45], we believe 49 § 32904 (a)(1)(A) provides the appropriate flexibility for EPA to include the incentive multipliers when calculating average fuel economy for a fleet. Using the same incentive multipliers as EPA is important for maintaining a harmonized, national program. We also note that Advanced Technology Vehicles use locally produced fuel (electricity, hydrogen, or CNG) that increase the nation's energy security, which was the original intent of the CAFE statute.

The incentive multipliers could be treated in CAFE with a fuel consumption improvement value (FCIV) similar to how off-cycle and A/C efficiency credits are handled[46]. EPA's recent NPRM describing technical corrections to the Advanced Technology Multiplier[47] proposes regulations that would require manufacturers to calculate the mega-grams of CO_2 credits with and without the ATV multipliers for each fleet. The difference between these values would be mega-grams of CO_2 attributable to the Advance Technology Multipliers.

Once the ATV mega-grams are known, the FCIV can be calculated as:

$$FCIV_{ATV}\left({}^{gal}/_{mi}\right) = \frac{(Mg\ of\ ATV\ Credits\ x\ 1{,}000{,}000)}{(VLM\ x\ Production\ x\ 8887)}$$

The $FCIV_{ATV}$ can then be included in the average fuel economy calculation along with the other FCIVs:

$$Average\ MPG = \frac{1}{\left(\frac{1}{MPG} - (FCIV_{AC} + FCIV_{OC} + FCIV_{PU} + FCIV_{ATV})\right)}$$

Effect of GHG ATV multipliers is uncertain – CAFE lacks comparable mechanism today

ATV multipliers can amplify the compliance impact of BEV/PHEV products if the desired penetrations can be achieved in the marketplace. If sales fall short of expectations, manufacturers would lose the large CO2 compliance lever electrified products provide and the amplification effect of the multipliers. So even ATV multipliers come with risk.

The analysis above shows the benefits of ATV multipliers to FCA based on a 5% PHEV/BEV electrification take rate in MY2025. This is 3X todays PHEV/BEV market rate of 1.5% and is no means certain in the timeframe of this regulation.

Most importantly, ATV multipliers are only available in the GHG regulation and are not currently available in CAFE regulation. That is, there is no comparable ATV multiplier opportunity to address the CAFE compliance gap

[45] 77 Fed. Reg. 62628
[46] CFR §600.510-2
[47] Light-Duty Vehicle GHG Program Technical Amendments 83 Fed. Reg. 49349 (October 1, 2018).

FCA and industry face.

FCA believes the effort to define one national program that works requires EPA and NHTSA programs to be harmonized. Therefore, FCA asks that NHTSA consider incorporating ATV multipliers into the CAFE program. FCA realizes the complexities around integrating such a flexibility and has discussed potential approaches earlier in this section. If NHTSA chooses not to incorporate multipliers, then the agency must address the compliance gap in CAFE and net compliance differences between CAFE and GHG caused by differing flexibilities by adjusting footprint stringency accordingly (like is done today for GWP A/C refrigerant credits). This is not an ideal solution, because it would induce disparate competitive impacts depending on an individual OEM's electrification rates.

Further flexibilities are needed to address CAFE / GHG differences and market uncertainties

The above recommendation requires multiple market and regulatory obstacles to be solved – a few of the more important ones are:

- Market accepts an electrification take-rate considerably higher than today's rate
- EPA extends and doubles PHEV and BEV multipliers
- NHTSA adopts similar ATV multipliers
- The ultimate GHG/FE standards don't differ much from Alt1

- EPA and NHTSA footprint curves include equal flexibility differences between the programs
- Upstream emissions are not included

To overcome the obstacles above, additional flexibilities should be added. Flexibilities such as 2WD UV relief, expansion and simplification of Off Cycle Credit Programs, and expanding incentives for mild and strong hybrid technology to all trucks, are discussed in detail in the Secondary Actions section later in this comment response.

ATV multipliers are specifically highlighted as a critical portion of FCA's comment and request since they have the most significant impact on compliance performance, offer the best opportunity to recover the compliance gap, and serve to incentivize the necessary growth of the PHEV/BEV market.

Removing Upstream Emissions - Automakers Should Not Be Required To Account For Another Industry's Emissions

Complicating a shift towards electrification is the requirement that holds plug-in electric vehicles accountable for CO_2 from electricity generation at utility power plants. FCA is already concerned about customer acceptance of electrified products and this requirement devalues the benefit of plug-in electric vehicles to be comparable to HEVs, effectively negating the billions of dollars of costly investment in this advanced technology. It also works directly against the California Zero-Emission Vehicle (ZEV) mandate. Since these utility emissions are being regulated by EPA and the States, they should not be assigned to automakers who have no control over their generation.

FCA fully supports the Alliance position stated in past comments, and we maintain there is no justification for regulating upstream emissions for ATVs via automakers. Automakers have no control over the feedstock that power plants use to create electricity, nor do we have control over the conversion or transportation processes, or where and when a vehicle owner recharges a vehicle. The entities with control over those emissions are the federal and state agencies that regulate power plant operation and performance, the power companies that buy and sell power from different energy sources, and the vehicle operators who decide when and where to recharge their vehicles – not the manufacturers who produce the vehicles. Assigning upstream emission factors to grid-powered vehicles would be inefficient. The entity to regulate is the utility who has direct control over the emissions, not the downstream user.

In the NPRM, the agencies have not proposed any revisions to the upstream emissions accounting requirements for ATVs under 40 C.F.R. § 86.1866-12(a). The agencies state that "incentives" such as zero upstream accounting could "distort the market."[48] The agencies did, however, request comment on whether incentives should be allowed to expire, and whether any of the flexibilities in their current regulations should be amended, revised, or deleted. We recommend that the agencies do not allow 0 g/mi upstream emission accounting to expire.

Upstream emissions from electricity generation outside the vehicle should be 0 g/mi. This should be the case for all model years and all vehicle volumes. Although the agencies are classifying 0 g/mi for upstream as an "incentive" for ATVs, we assert that 0 g/mi accounting is the way the regulation should have been set up initially. Automakers should not have been required to account for these emissions. Removing upstream accounting is not an incentive for ATVs, rather it is a correction that will remove responsibility for these emissions from an entity who has no control over them.

Other stakeholders have historically supported, and continue supporting zero upstream accounting for reasons similar to those described by the Alliance. The National Coalition for Advanced Transportation (NCAT) sent a

[48] 83 Fed. Reg. at 42998.

letter to EPA and NHTSA on May 2nd requesting regulatory reforms, including zero upstream emission accounting.[49] The Electric Drive Transportation Association (EDTA) asserted in their comments on the ONPII NPRM that "the proposal to include upstream emissions exceeds EPA's authority under Title II of the Clean Air Act."[50]

In the ONPII NPRM (EPA–HQ–OAR–2010–0799; NHTSA–2010–0131), other stakeholders, including environmental public interest groups such as the Union of Concerned Scientists (UCS), were in favor of upstream accounting because GHG emissions from electricity production are higher than GHG emissions from gasoline production. UCS stated in their ONPII rulemaking comments that "Accounting for upstream emissions is essential for accurately representing the emissions of electric vehicles."[51] Similarly, NRDC asserted that "awarding plug-in electric vehicles an emissions rate of 9 g/mi inaccurately reflects their real-world impact and reduces the potential GHG reductions of the program by up to 5.4 percent."[52]

Although upstream emissions from electricity production are greater than that of fuel production, the burden of accounting for these emissions should not fall on automakers, an action which has no precedent in other vehicle regulatory programs or, to our knowledge, any environmental regulatory program. In EPA's response to comments for the ONPII rulemaking, EPA made just this point, stating "there is no such comprehensive program addressing upstream emissions of GHGs."[53] The requirement for automotive companies to account for upstream emissions should not be contingent on whether or not another industry is regulated, regardless of the level of upstream emissions from electric vehicles.

Making vehicle manufacturers responsible for emissions over which they have no control is contrary to the Clean Air Act Section 202(a) that gives EPA authority to set "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines."[54] Upstream emissions are not emissions "from" vehicles or engines; they are emissions from power plants and other facilities involved in generating energy used for many purposes, such as powering vehicles.
Furthermore, requiring upstream accounting could impede development of BEVs or PHEVs, as accounting of upstream emissions degrades the CO_2 performance of BEVs to the level of PHEVs, and PHEVs to the level of a conventional hybrid electric vehicle. This, in effect, disincentivizes the technology.

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[49] Nat'l Coalition for Advanced Transportation, Letter regarding Advanced Technologies Compliance Flexibility Option for Model Year 2022-2025 Vehicles Standards Proposal, May 2 2018, https://www.regulations.gov/contentStreamer?documentId=EPA-HQ-OAR-2015-0827-1141i2&attachmentNumber=1&contentType=pdf.

[50] Letter from Genevieve Cullen, Vice President of the Electric Drive Transportation Association, to the Air and Radiation Docket of the Environmental Protection Agency, and the Docket Management Facility of the U.S. Department of Transportation (Feb. 13, 2012), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2010-0799-9449.

[51] Union of Concerned Scientists, Late Comment on Proposed Rule 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards (May 11, 2012) https://www.regulations.gov/document?D=EPA-HQ-OAR-2010-0799-11808.

[52] Nat'l Resources Defense Council, Comment on Proposed Rule 2017 and Later Model Year Light-Duty Vehicle and Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards (Feb. 14,2012), https://www.regulations.gov/document?D=EPA-HQ-OAR-2010-0799-9472.

[53] Alliance of Automobile Manufacturers, Comment on Proposed Rule 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards (Feb. 14, 2012), 76-77, https://www.regulations.gov/document?D=EPA-HQ-OAR-2010-0799-9487 (quoting 76 Fed. Reg. 74854, 75010 (Dec. 1, 2011)).

[54] 42 U.S.C. § 7521(a) (emphasis added).

FCA requests that the EPA revise its standards so that manufacturers are not required to account for upstream emissions from ATVs. This should be the case for all model years and all vehicle volumes.
Specifically, FCA recommends the following revisions to the regulatory text:

40 C.F.R. § 86.1866-12(a): Remove paragraph about upstream altogether.

40 CFR 600.113-12(n):

Fix equation in 40 CFR 600.113-12 (n) so that there is no accounting for upstream CREE

BEVs: CREE = 0

PHEVs and Fuel Cell: Remove the statement about using adding upstream emissions using the calculation method for BEV CREE.

CAFE Credit Life Extension

In the SAFE NPRM agencies state that they believe longer credit life would provide manufacturers with additional flexibility to further integrate banked credits into their product plans and requested comment on extending the life of credits beyond five years, or even potentially introducing unlimited credit life.[55]

The Alliance has recommended three potential approaches:

i) Credits earned from MY2010 and later would have credit life extended through MY2025
ii) The lifetime for all credits would be extended to a longer fixed period greater than the current five-year lifetime
iii) GHG credits would have an indefinite (unlimited) lifetime

FCA agrees that the GHG credit trading program provides OEMs significant flexibility, and agree with the potential benefits to industry extending life would have – however these benefits only occur if credits are actually used.

As discussed earlier, industry on average faces an unavoidable compliance gap that requires the use of credits through MY2020. Depending on the outcome of this regulation this period could be extended well past MY2021. This period is also influenced by how industry uses credit banks. Assuming perfect trading industry credits are forecasted to run out by MY2021. However, OEMs are not required to participate in the credit market by regulation, meaning it will be a business decision for OEMs to buy or sell credits. Given the uncertainties of the compliance gap industry faces now, it is reasonable to assume OEMs may decide to retain credits as long as is allowed as a protective measure against future regulatory uncertainty.

Figure 28 shows current credit banks for major OEMs based on the EPA's GHG Performance Report.[56] Though industry has banked credits, which could allow compliance flexibility – the distribution across OEMs is disparate. The agencies should also recall that a portion of these credits were accumulated in MY2010 – prior to the start of the MY2012-2025 current regulation.

FCA supports the Alliance request to extend credit life, but notes the potential adverse risk of allowing unlimited credit lifespan. Imposing an appropriate limitation on credit lifespan promotes a fluid credit market and credit

[55] NPRM, 83 Fed. Reg. at ,43464.
[56] EPA 2016 GHG Performance Report, Executive Summary - page v

trading by incentivizing OEMs to participate in an industry trading program instead of banking unused credits in perpetuity.

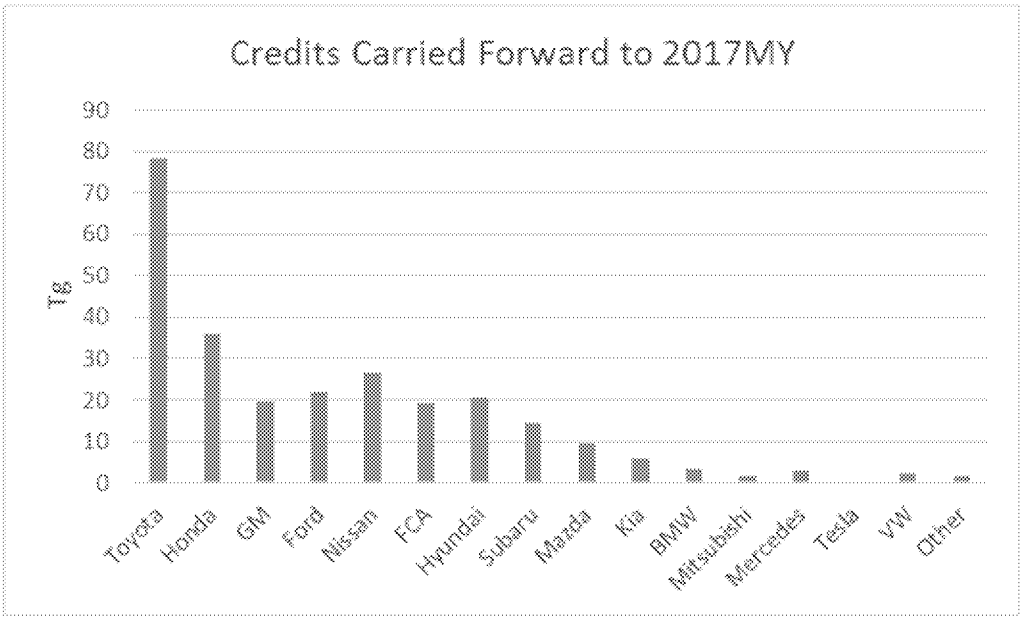

Figure 28: GHG credits are spread unevenly among OEMs. [57]

Secondary Actions: Provide Other Flexibilities if Electrification Take Rates Slow

2WD UV Standard Adjustment

The last several years have witnessed an organic shift in consumer buying patterns away from higher-fuel-economy small and midsize passenger cars toward more capable crossovers and utility vehicles. This market shift was clearly not anticipated when regulations were finalized in 2012. The forecasts referenced by the agencies at that time showed car sales increasing from 50% to 57% of annual vehicle sales by 2025. Instead, car sales have significantly dropped to 36% of the total fleet by 2017 – the opposite of the expected trend. Over that same period, the utility vehicle market share has grown from 30% to over 40%.

This shift in consumer preference presents a compliance challenge, even in a system with footprint-based standards. A 2WD utility or crossover vehicle with a GVWR of less than 6,000 lbs. is not allowed by regulation to be in the Light Duty Truck (LDT) fleet, while a similar vehicle over 6,000 lbs. GVWR would be permitted in the LDT fleet. One of these smaller 2WD utility or crossover vehicles, with the same powertrain and technology as a sedan with a smaller footprint, generates 2-4 fewer mpg without adjustment to its standard (as shown in Figure 29: Passenger Car & 2WD SUV Comparison).[58] With U.S. gas prices remaining low, consumers are showing that they are willing to make a fuel economy trade-off for the versatility of a crossover or SUV. This is a significant contributing factor to the growing industry compliance gap, which needs to be addressed in this rulemaking.

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[57] *Id.*

[58] Footprint data from CAFE Model for 2018 NPRM for Model years 2021-2026 Passenger Cars and Light Trucks Central Analysis, 2018_NPRM_market_inputs_ref.xlsx, available at https://www.nhtsa.gov/corporate-average-fuel-economy/compliance-and-effects-modeling-system; Fuel Economy data from 2016 FE Guide for DOE-OK to release-no-sales-4-27-2017Mercedesforpublic.xlsx available at https://www.fueleconomy.gov/feg/download.shtml.

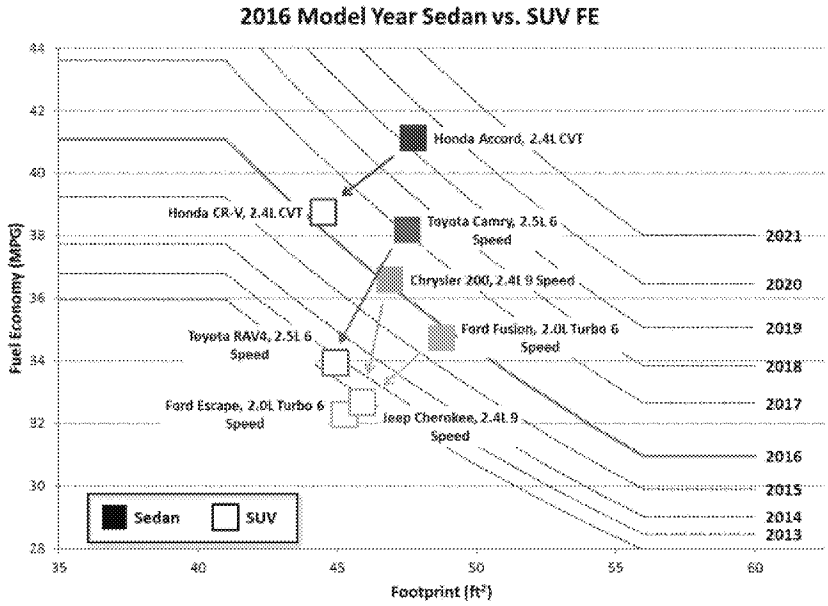


Figure 29: Passenger Car & 2WD SUV Comparison[59]

Given the magnitude of the compliance challenge for these vehicle types, one possible solution is for FCA to change the drivelines available in vehicles it offers customers in order to comply with the more appropriate LDT standard. This may be more affordable compared to the investment in fuel saving technologies for crossover and SUV vehicles to achieve compliance with the PC standards.

Alternatively, increasing the vehicle size and/or load capacity to achieve a GVWR of at least 6000lb is another means of shifting the compliance requirement to the LDT standard. Both options have the unintended consequences of burning more fuel and emitting more CO_2.

Additionally, the industry mix shift towards SUVs and crossover vehicles increases the difficulty of meeting the Domestic Minimum Standard (DMS) since the smaller 2WD utility and crossover vehicles tend to reduce the overall compliance of the PC fleet. The DMS is currently established based on a forecast model mix and does not adjust for a customer driven shift in that mix.

But these smaller 2WD SUVs and crossover vehicles have a combination of truck-like characteristics that customers prefer – elevated/off-road ground clearance and seating position coupled with expanded cargo carrying ability.

There are two possible solutions to address the conflict between consumer desires and the current regulation.

[59] Footprint data from CAFE Model for 2018 NPRM for Model years 2021-2026 Passenger Cars and Light Trucks Central Analysis, 2018_NPRM_market_inputs_ref.xlsx, available at https://www.nhtsa.gov/corporate-average-fuel-economy/compliance-and-effects-modeling-system; Fuel Economy data from 2016 FE Guide for DOE-OK to release-no-sales-4-27-2017Mercedesforpublic.xlsx available at https://www.fueleconomy.gov/feg/download.shtml.

Preferred Solution – Revise LDT Classification

One solution to the 2WD utility and crossover vehicle challenge is a shift of these vehicles to the light duty truck fleet. In the NPRM, NHTSA notes that:

> [C]ertain vehicles that DOT decides by regulation are not manufactured primarily for transporting not more than 10 passengers are not passenger automobiles. NHTSA's regulation on vehicle classification, contains requirements for vehicles to be classified as light trucks either on the basis of off-highway capability or on the basis of having "truck-like characteristics." Over time, NHTSA has refined the light truck vehicle classification by revising its regulations and issuing legal interpretations. However, based on agency observations of current vehicle design trends, compliance testing and evaluation, and discussions with stakeholders, NHTSA has become aware of vehicle designs that complicate light truck classification determinations for the CAFE and CO_2 programs.[60]

We agree that NHTSA has the flexibility to consider regulatory changes based on the truck-like characteristics of a vehicle, and that small SUVs and crossovers are a complication due to their exclusion from light truck classification. Including these vehicles in the LDT fleet would simplify the situation by aligning standards with capability, similar to how their 4WD variants and the larger 2WD versions are regulated. The elevated/off-road ground clearance and seating position, coupled with expanded cargo carrying capacity of today's small SUVs and crossovers, reflect the truck-like characteristics that the agency can use in determining new regulations.

We propose adding new criteria to 49 C.F.R. § 523.5(a) as follows:

(6) Permit expanded use of the automobile for cargo-carrying and other nonpassenger-carrying purposes through:

(i) An extended roof-line and expanded cargo capacity with at least one row of seats that fold or stow to create a flat, leveled cargo surface extending from the forward most point of installation of those seats to the rear of the automobile's interior, and
(ii) Less than 6,000 lbs. GVWR and meets 4 out of 5 off-road criteria as defined in paragraph (b)(2) of this section.

This change would address both the mismatch of the standards with this type of vehicle, and FCA's challenge with achieving the DMS requirement.

Alternative Solution – Provide PC Fleet Adjustment

While FCA sees no issue with a regulatory change that would enable the determination of small SUVs and crossovers to be non-passenger automobiles, we propose the following alternative if reclassification is problematic.

To account for the unique capabilities of this customer demanded segment, the agencies could provide an adjustment to the CO_2 and fuel economy requirements, either directly by easing the standard by approximately 40 g/mi, or indirectly through an offset of the model type footprint by about 12 ft^2(as shown in Figure 30: Proposed Footprint Standard Adjustment for 2WD SUVs and Crossovers in PC fleet.

[60] NPRM, 83 Fed. Reg. at 43438.

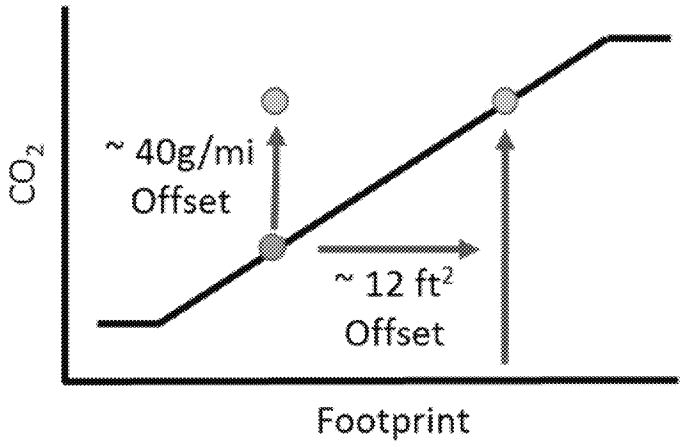


Figure 30: Proposed Footprint Standard Adjustment for 2WD SUVs and Crossovers in PC fleet

Although this proposed method applies an offset in CO_2 by 40 g/mi, it is independent of the actual difference in standards between PC and LDT compliance curves at a given footprint. A regulatory offset to the footprint has an additional complication in that the modified footprint may land in the upper flat standard portion of the curve and thus achieve less than the intended CO_2 relief.

For these reasons, this method is less preferred than the proposed shift of this segment to the LDT fleet.

In conclusion, a CO_2 adjustment of footprint offset would help account for the higher fuel consumption and CO_2 emissions of this customer demanded segment and should be considered if NHTSA cannot revise the regulations that define the truck-like characteristics of vehicle classifications.

Adjustments that equalize the larger compliance task on trucks versus cars today;

More than half of the eight alternatives detailed in the SAFE NPRM, Alternatives #4, 5, 6, 7, and 8, propose a greater ramp rate in footprint stringency for the light-duty truck fleet than the passenger car fleet. FCA agrees with the Alliance comments and opposes increasing truck stringency more than cars.

Our rationale for this is two-fold;

(1) In MY2017, the latest data we have available, most trucks have a larger gap to standards than cars, and

(2) All of the truck segments are challenged because consumers are placing a greater emphasis on capability than fuel economy.

While manufacturers are adding equivalent levels of technology, it is clear the market is choosing specific vehicle attributes that have higher energy demand. We discussed the increased demand for 2WD utility vehicles earlier and their inherent higher energy demand than equivalent footprint sedans. The agencies need to consider the "Feasibility and practicability of the standards"[61] when customers are demanding attributes that are not completely aligned with the regulatory requirements.

[61] Title 40; Chapter I; Subchapter C; Part 86; Subpart S §86.1818-12 Greenhouse gas emission standards for light-duty vehicles, light-duty trucks, and medium-duty passenger vehicles.

We later discuss an example in which 8 of 10 Ram 1500 4x4 customers pay a premium for a V8 Hemi engine to get the greater capability it offers even at the expense of compromising the additional fuel economy available with a V6 Pentastar engine. This concern is present throughout the light truck segment. Consumers are also demanding utility vehicles where towing, 4WD, and higher ride height are highly valued. A regulatory mechanism is needed to capture these types of features that are independent of the current footprint metric.

Trucks have larger compliance task than cars in MY2017

Figure 31 is Novation Analytics' assessment of vehicle performance to current standards for five different vehicle segments. It clearly shows burden in all segments is increasing. It also re-emphasizes the gap – all segments are below standard in MY2016-2017. Important to this discussion, cars with truck-like features (Car SUV) and the traditional truck segments are all tasked more than the car fleet.

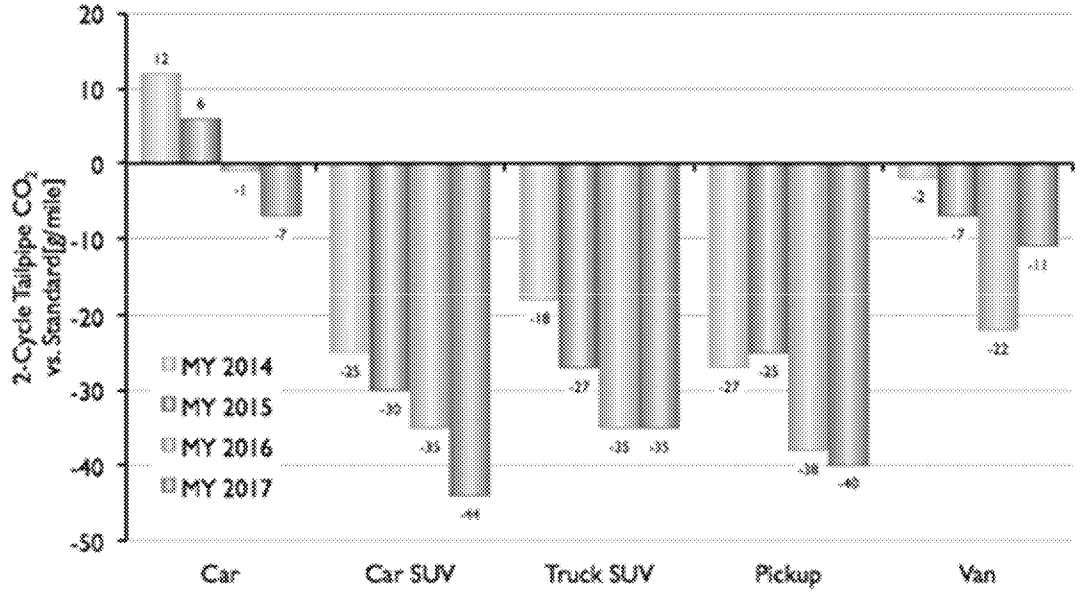


Figure 31: CO_2 Performance-to-Standard[62]

It is important to note that footprint-based standards only adjust for vehicle attributes captured by changes in the dimensions of vehicle track width and wheelbase length. As discussed earlier in this comment response, a UV can share the same footprint as a passenger car but can lose up to 4 mpg in performance due to the higher energy demanded for the added capability; higher ground clearance and improved seating position (i.e., larger frontal area).

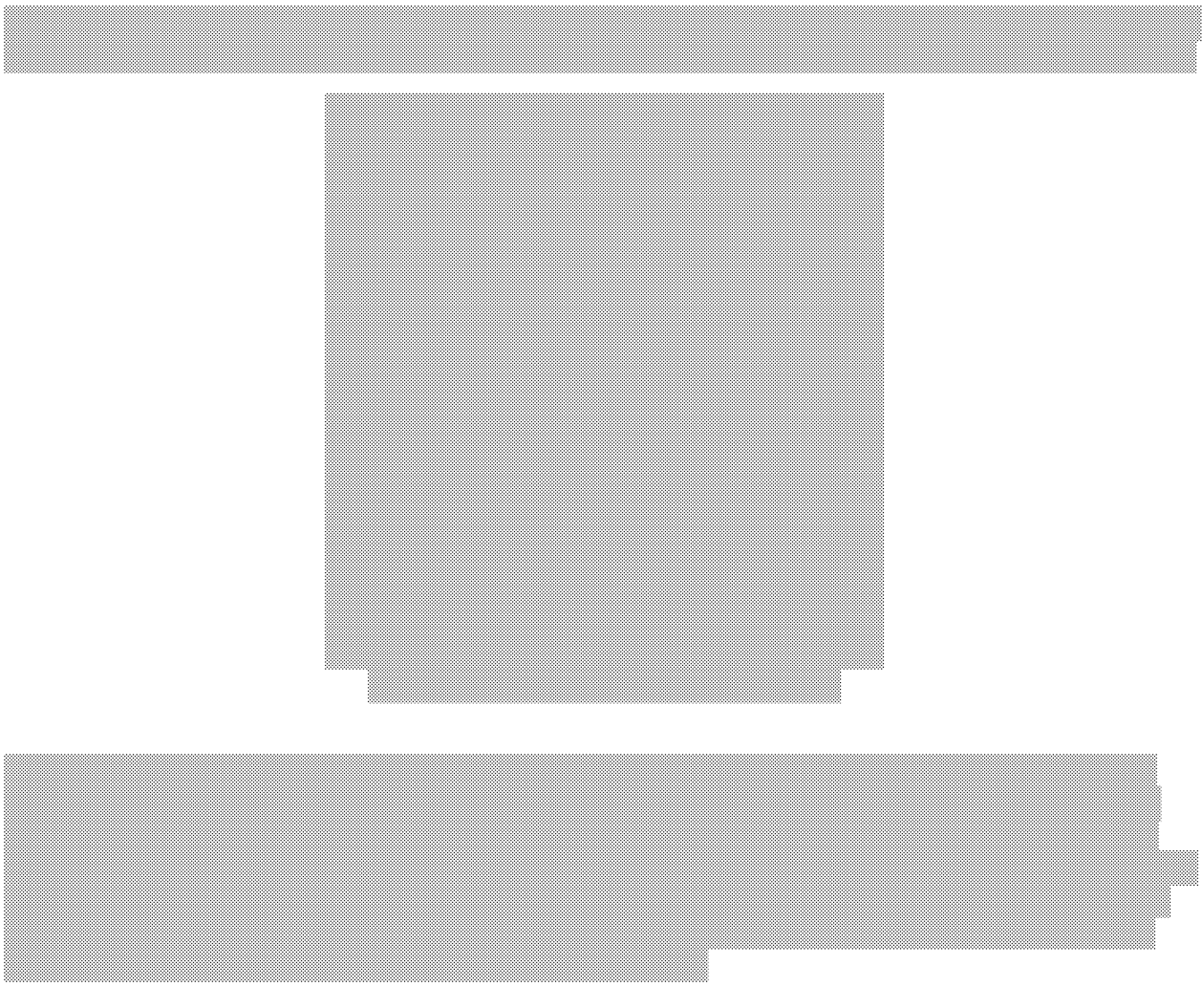
As regulators adjust footprint standards, FCA is asking that this discrepancy in task be addressed. Higher ramp rates in stringency for trucks versus cars will only widen the existing performance to standards gap. For this reason, FCA does not support Alternatives #4, 5, 6, 7, and 8.

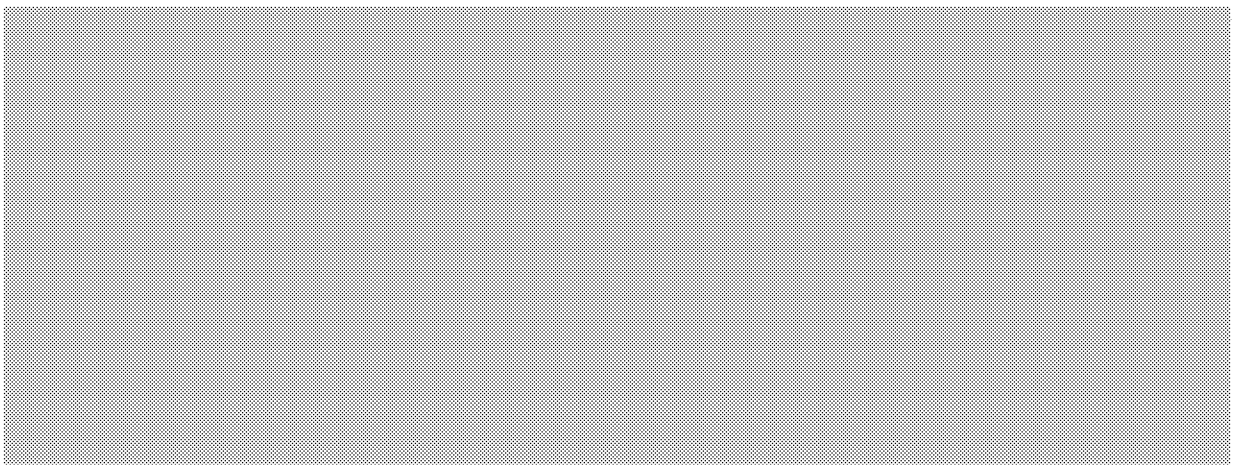
[62] Novation Analytics, personal communication to Alliance of Automobile Manufacturers

Pickup Truck Buyers Demand Capability

Pickup truck buyers are placing a very high priority on capability. It may be a tradesperson who must haul a large payload for their job or a weekend hobbyist that needs to tow a boat. The energy demands required for that capability are a characteristic that needs to be better accounted for in the truck footprint standards.

Figure 31 shows that the pickup truck segment is the most challenged of all truck segments in MY2017. A comparison may help to demonstrate the unique character of the pickup segment. FCA offers the same 3.6L Pentastar V6 and 5.7L Hemi V8 engines in both our Grand Cherokee SUV and Ram 1500 pickup. In both cases consumers are charged a premium for the more-capable V8.





While some attempts were made to account for product mix when setting current fuel economy standards, it is clear the footprint standard does not fully account for pickup truck capability and the components needed such as larger powertrains, greater mass and frontal area.

FCA requests agencies correct LDT standards to reflect the current market preference for capability over efficiency, and introduce mechanisms into the regulation that can adjust for efficiency and capability trade-offs that footprint standards currently ignore.

Expand Mild and Strong Hybrid Credits to All Light-Duty Trucks

Hybrid technology will be a necessity across the entire fleet in order to attain compliance with any of the NPRM proposals from flat standards through the augural standards with a key difference being technology penetration rates between the various proposals. The full size pickup segment has substantially lagged behind passenger car segments with respond to adopting hybrid offerings. General Motors offered a micro hybrid system on full sized pickup trucks from MY2004-2007, and then a strong hybrid full sized pickup truck from MY2009-2013. Neither of these offerings were accepted on a large enough scale in the market to justify continued production, and each offering was subsequently discontinued. The incentives in the current rule have resulted in two different manufacturers now offering mild hybrid systems on three different full size pickup truck powertrains available today, with likely more mild hybrid, strong hybrid, and plug-in hybrid options in the development pipeline. Full size pickup truck buyers are more resistant to change, especially with powertrain technologies, than buyers of any other class of vehicle, and thus it will take substantial time for these technologies to gain significant penetration rates and become accepted by the majority of buyers. All of the full size pickup credits – strong hybrid, mild hybrid, 20% better performance, and 15% better performance – should be extend in full throughout the duration of this rulemaking window through MY2026. Minimum penetration rate requirements for individual years should also be eliminated. It would be more appropriate to consider a maximum threshold above which a technology's stability in the market would be considered to no longer warrant an incentive. This program needs to bridge the gap between what the full size pickup market will currently accept, and eventually getting these technologies accepted by a majority of buyers. Having mechanisms that eliminate these credits before these technologies are able to gain widespread acceptance through either premature termination or required penetration rates could cause these product offerings to be discontinued. This could leave a stigma on these technologies as not fit for full size pickup applications, further inhibiting future attempts to bring these technologies back into this segment.

To provide meaningful incentives to help further advance these technologies, increase fleet penetration rates, and build meaningful economies of scale, these incentives should also be applied to all light duty trucks. This segment has historically lagged behind the passenger car fleet with adoption of hybrid technologies because the

cost premiums for hybrid technology increases exponentially with increased vehicle weight and utility requirements. Figure 34 shows this through hybrid vehicle sales by segment.

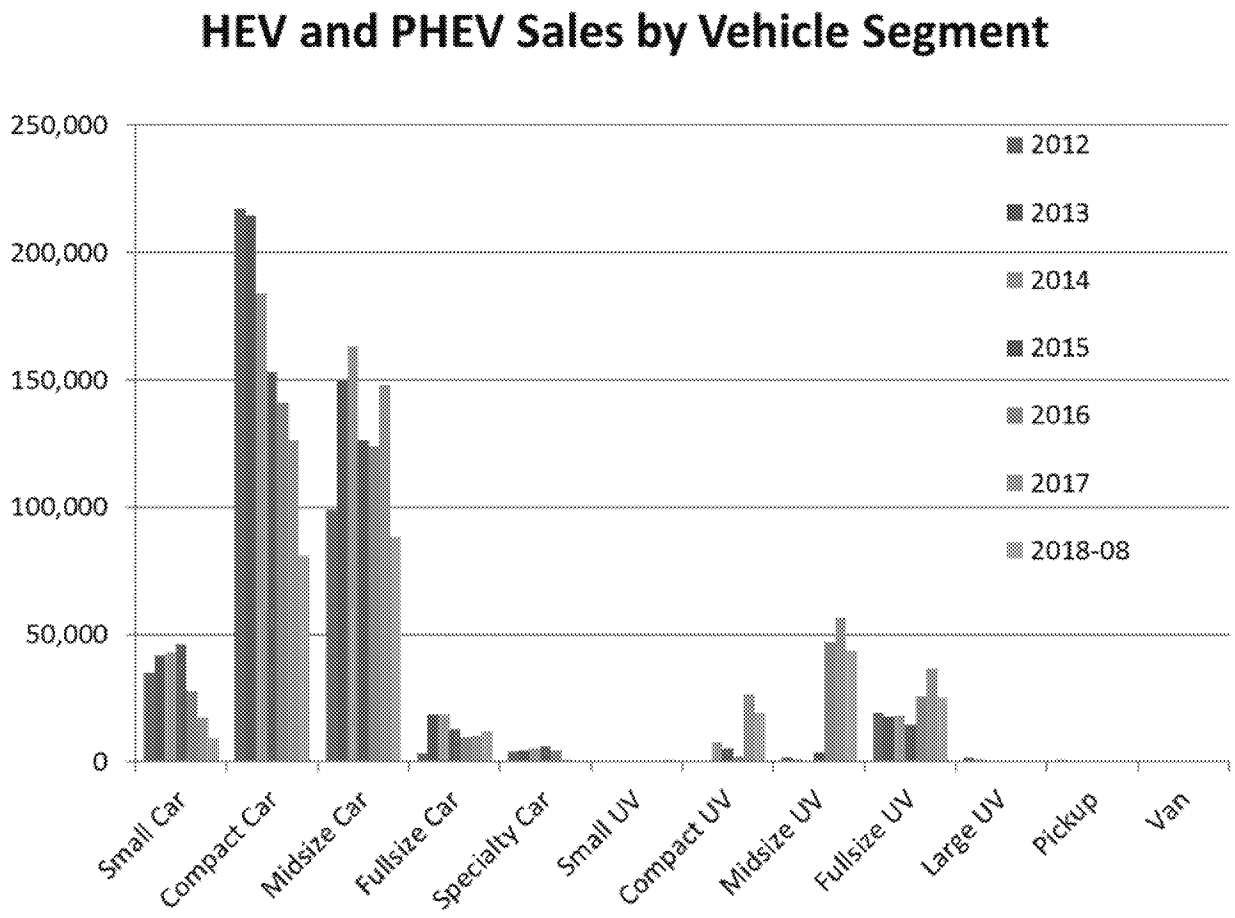


Figure 34: Hybrid Sales by Vehicle Segment[63]

Promoting hybrid technology in the entire light-duty truck segments is needed. The agencies contend that smaller footprint trucks fall on the lower part of the truck curve, which have a higher rate of improvement (in stringency) than the larger trucks, thus making them more comparable to cars in terms of technology access and effectiveness. However, cost remains a hurdle for acceptance of hybrids in the smaller, lighter truck segments. All of this warrants some level of incentive for hybrids beyond the large pickup truck segment as a way to encourage the growth and proliferation of hybrid technology that has been largely confined to the passenger car segment.

Summary of FCA Recommendations

FCA believes strongly in, and must continue with, the sustained unprecedented improvement of fuel economy and reduction of GHG emissions.

[63] Source: IHS Registrations through August 2018 excluding medium-duty, heavy-duty and bus.

FCA supports an alternative that allows FCA and the industry to close the growing compliance gap with continued improvements from today's fuel economy and GHG emissions levels at a challenging but market-feasible rate. We believe the best 50-State NPRM alternative to accomplish this would comprise:

- Significant adjustment to the footprint-based standards (MY2021-2026) as a means of maintaining performance improvement, to reverse the widening compliance gap and its anticipated impact on credit availability;
  - When the current compliance gap is acknowledged, even Alternative 1 requires near historic rates of improvement and FCA still struggles to overcome the credit deficit
  - As rates increase, even minimally above Alternative 1, additional flexibilities are needed that require a check of harmonization before finalizing
  - [redacted]

- Adjustments that equalize the larger compliance task on trucks versus cars today;
  - Recognize 2WD UVs for their truck-like capability

- Extending and doubling PHEV/BEV multipliers in both the CAFE and GHG programs
  - A powerful tool to help counter the effects of the credit burn mode industry is currently in
  - Helps to incentivize electrification while cost, range, and infrastructure challenges are addressed;

- Increased EPA GHG to NHTSA MPG footprint curve offset to account for all differences that cannot be harmonized;

- Actions that reduce industry risk due to market uncertainty of advanced technologies, such as …
  - Extending/expanding ATV credits to further encourage advanced technology propagation
  - Expanding/simplifying off-cycle credit programs

- Continued acknowledgement that upgraded refrigerants and improved refrigerant management benefit the GHG program (Section 4);

- Exempting auto manufacturers from responsibility for upstream emissions produced during electricity generation (Section 2); and,

- Recognizing FCA concurs with the legal rationale behind preemption, but remains focused on the primary goal of establishing One National Program with CARB, EPA and NHTSA (Section 6).

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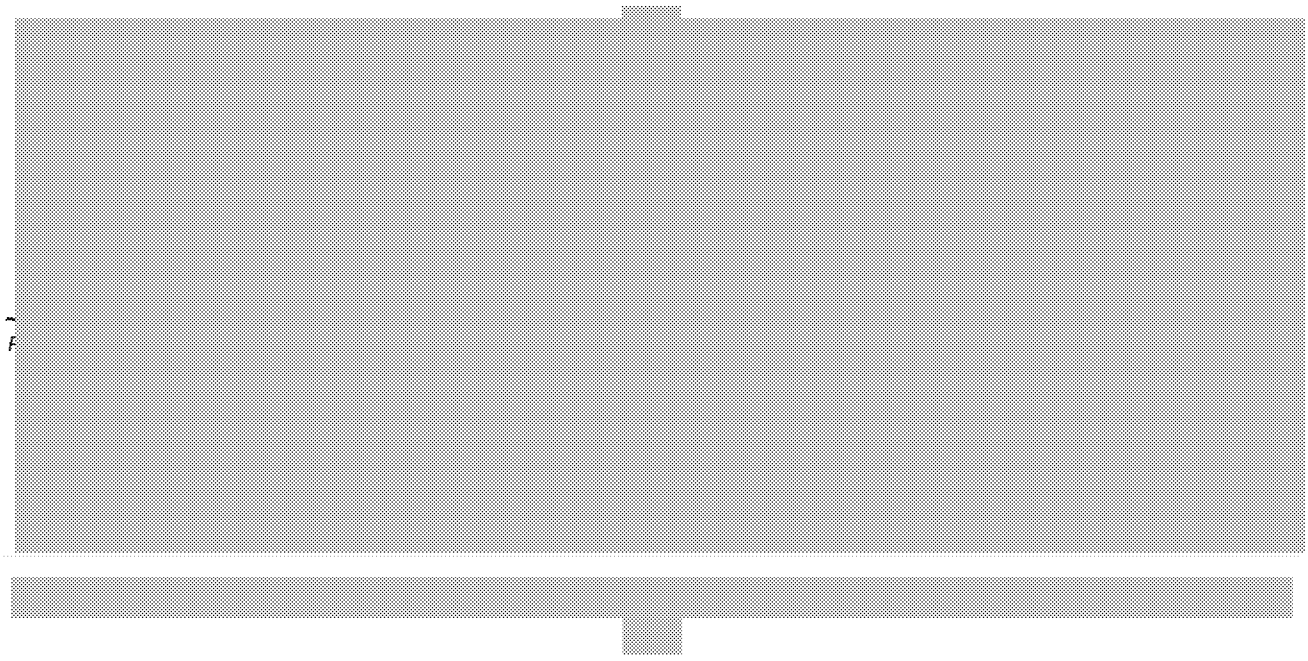

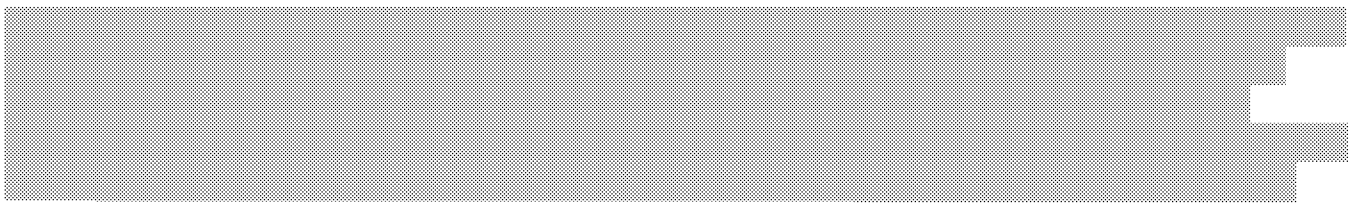

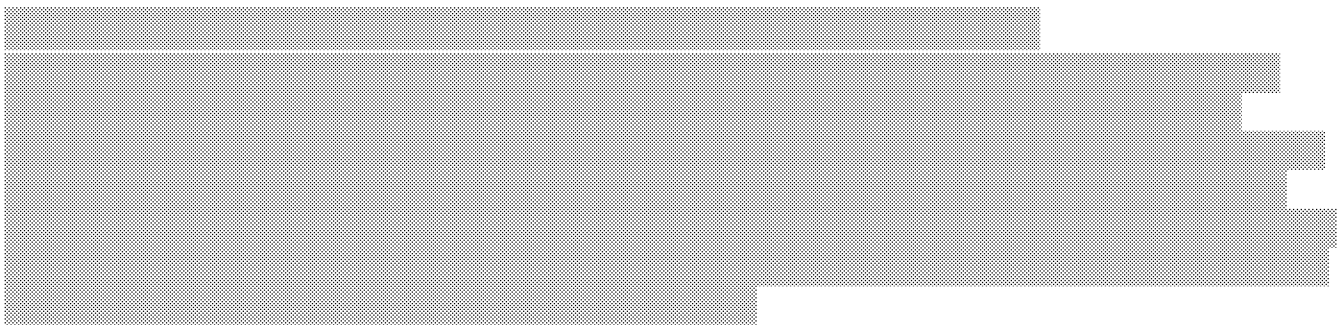

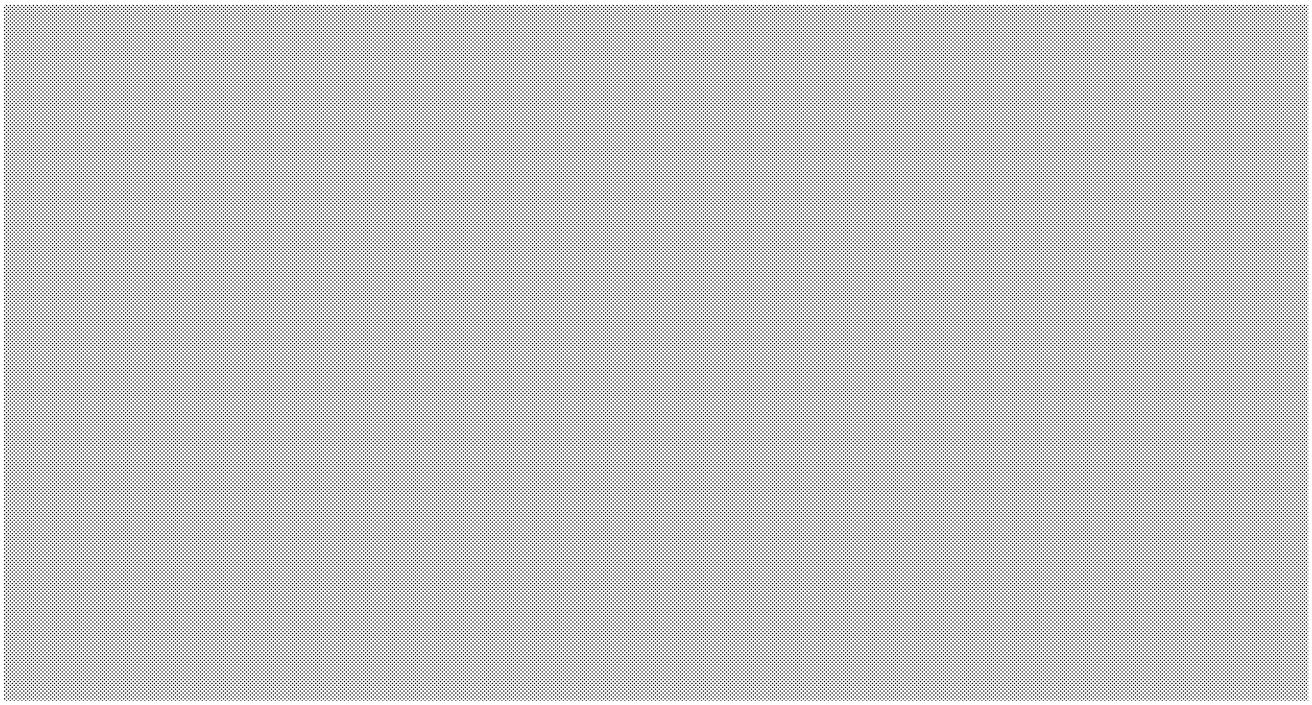

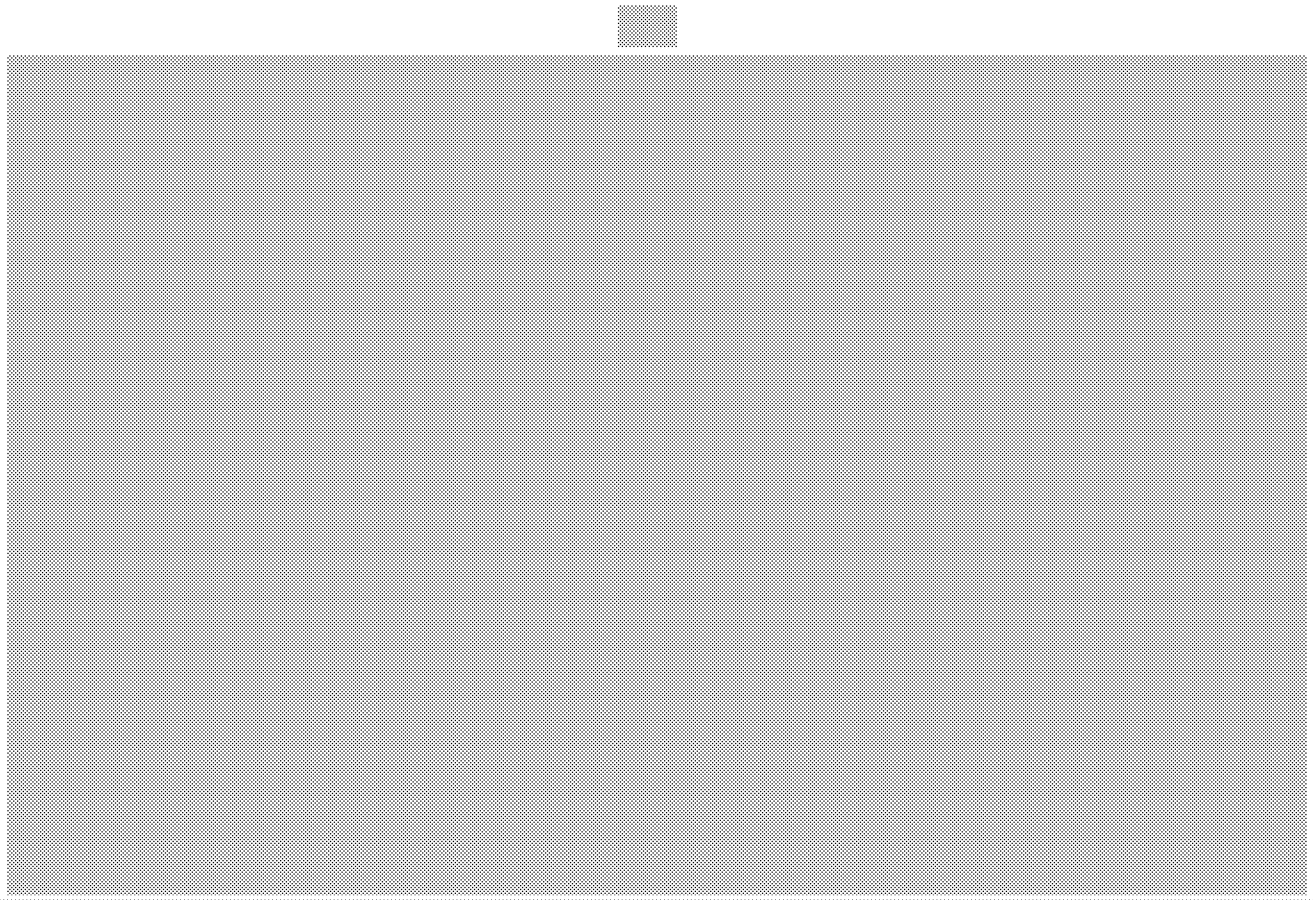

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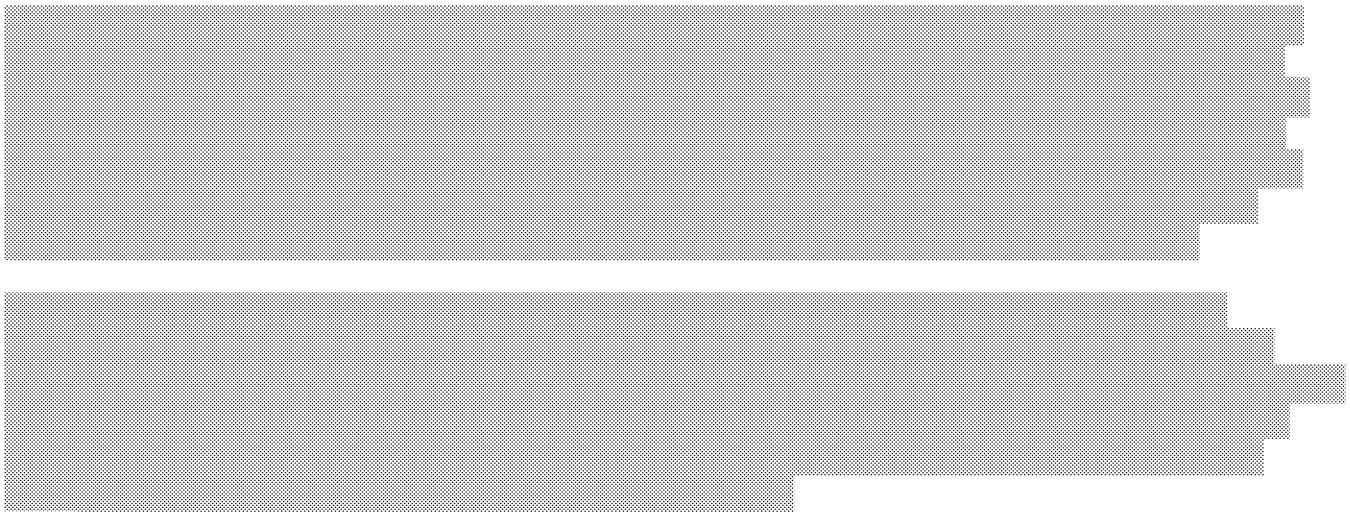


4. Comments on Flexibilities (Refrigerant / A/C Efficiency / Off-cycle)

Retain Low Leak A/C Credit Mechanism

The NPRM requested comment on whether the refrigerant leakage crediting mechanism should remain in the EPA vehicle GHG regulation. Recall the "leakage" crediting mechanism has two components: incentivizing the use of new, low GWP refrigerant (1234yf) and minimizing leaks of older, higher GWP refrigerants (R134a) with regulatory credit in the vehicle GHG regulation. FCA supports EPA retaining the current leakage mechanism – especially without an alternative mechanism identified.

Removing Leak Mechanism Works against One National Program

If the low leak program regulating MAC emissions is removed from the light-duty vehicle regulations, it is likely that replacement regulations would be developed covering refrigerant leakage. There are no proposals or details for a replacement regulation in the NPRM. FCA is concerned that without federal coverage, states could enact a patchwork of refrigerant regulations throughout the country.

FCA believes that if the low leak program is eliminated, there should be a multiyear transition period over which time A/C systems can be redesigned. The existing low leak program would continue until the transition period ends beyond MY2021. If the leakage program were to be removed, it is imperative that the EPA footprint curves are adjusted so there is no net stringency increase. Recall, there is a delta between EPA and NHTSA footprint curves today that accounts for the credit in EPA space, which is not available in NHTSA space. Notably, if the refrigerant credit is removed from the program the EPA curves need to be adjusted accordingly.

Moving Solar Thermal Technologies to Air Conditioning Efficiency Table

FCA supports the agencies' proposal to move the solar thermal credits from the Off-cycle Technology Table to the A/C Efficiency Table. The new table would add the solar-thermal technology credit values to the credit values for the MAC efficiency technologies. This realignment agrees with, and was influenced by, recent work National Renewable Energy Lab (NREL) performed and presented to at the Society of Automotive Engineers ("SAE") Thermal Management System Symposium ("TMSS") in October 2017.

NREL further determined that certain credits related to the combined menu technologies are more valuable than first thought. FCA asks that the agencies adopt these credit values as shown below in Figure 54 in Appendix 2.

FCA asks the agencies to remove the cap on the MAC Efficiency Table Credits. FCA believes that emerging MAC technologies will deliver personal comfort in new ways that were not even considered when setting the current caps. Enforcing credit caps based on older assumptions will stifle innovations and slow the introduction and adoption of new technology as vehicles transition occupant cooling from the "bulk comfort" systems of today, into the more energy efficient "personalized comfort" realm of tomorrow.

In the event that the agencies determine that a cap is necessary for the A/C Efficiency Table, FCA asks that the current cap be raised 64% based on the NREL work referenced above. NREL found that EPA undervalued today's credits because of an underestimation of fuel consumption attributable to A/C operation. NREL showed the fuel consumed due to A/C operation, and adjusted the value of the technology crediting accordingly (i.e., 64%).

Separately, FCA asks that the AC17 test be discontinued as a validation methodology for credit levels. The AC17 test was designed to show a GHG difference between two technologies in A to B testing. The operating conditions of the test were set based on the ambient and solar limitations of the emissions test chamber, not the real world conditions where the A/C systems operate and the efficiency technologies are most effective. The AC17 test still has value as it was originally designed and when applied appropriately. The NREL work referenced above showed that the AC17 test could not come close to validating the effectiveness of the efficiency technology's benefit.

EPA asks for no validation testing when OEMs use the off-cycle table credit that the agency developed and finalized in rulemaking. The A/C Efficiency Table credits should be treated similarly.

FCA lastly asks the agencies to add new and emerging technologies to the A/C Efficiency Table as discussed below in Appendix 1. FCA asks that EPA add Denso SAS compressors, scroll compressors, and actively cooled seats to the standard table technologies. Details on the credit level for these technologies can be found in Figure 54 in Appendix 2.

Off-Cycle Technology Program Improvements

Flexibilities in the form of off-cycle technologies are an important part of manufacturers' pathways to compliance as they allow credit for technologies that improve customers' on-road fuel economy, even though the fuel economy improvements from these technologies may not be observed in the laboratory. The off-cycle program, while in need of improvement, has been supported by all stakeholders (agency and industry). There are three unique pathways for claiming off-cycle credit that encourage technology implementation: the pre-defined technology table, the 5-cycle methodology, and the alternative methodology.

The first of the three paths for claiming off-cycle credits, the pre-defined technology table, has proven to be the most useful. The table technologies, defined by EPA and NHTSA in regulation, allows manufacturers that meet the technology definitions to claim credit values from the table. The bulk of the off-cycle credits earned to date are from the pre-defined table, as OEMs are assured of receiving credit when they deploy the technologies from the table. Below, FCA identifies several ways that this very useful tool can be further improved.

The second path to claiming off-cycle credits, the 5-cycle pathway, allows OEMs to quantify the benefit of technologies that are not realized or are only partially realized on laboratory 2-cycle testing. FCA applauds the

EPA for undertaking separate rulemaking that, when complete, will make this pathway workable. Up until this point, the agency has not recognized or rewarded this pathway.

The third path is the Alternative Methodology where manufacturers identify the technology, demonstrate the value of the technology with testing and data, and submit an application to the EPA to acquire credit for the technology. The process incorporates public scrutiny and comment before the technology credit is approved by EPA. Currently, this pathway works poorly. Below, FCA recommends some steps the agencies should take to improve this process that would enable OEMs and suppliers to take advantage of this method and deploy more fuel saving technologies.

Off-Cycle Credit Table

FCA believes the following changes should be made to the predefined technology table in order to expand the value of the program and simplify the process of acquiring credits for certain technologies.

1. Expand the Off-Cycle Table Credit Caps
2. Add Off-Cycle Technologies to the Existing Table
    a. Transfer Approved Alternative Methodology Applications to the Table
    b. Add New Off-Cycle Technologies to the Table
3. Transfer Thermal Control Technologies to the AC Efficiency Table

Expand Off-Cycle Table Credit Caps

From MY2012 to MY2016, industry's application of off-cycle technologies to the U.S. fleet has tripled[65] (2X on car fleet and 4X on truck fleet) to 3 g/mi. Manufacturers rapidly deployed technology in response to this all-new regulatory mechanism – a recognition of the cost-effectiveness of these technologies that have on-road fuel economy and GHG emissions benefits which are not completely captured during laboratory testing. With this early success, FCA expects this industry adoption of off-cycle technologies will at a minimum continue at the current rate, or accelerate. In the MY2021-2026 timeframe of the proposed rule, it is likely that manufacturers will hit the existing 10 g/mi cap.

Knowing that this regulatory mechanism incentivizes industry innovation, manufacturers need regulatory certainty to fund the needed investment in the technology. The draft rule seeks comment on past industry requests to remove the 10 g/mi off-cycle table cap completely, and FCA supports this proposal which will unleash industry innovation. Left in place, the cap is stifling the deployment of fuel saving technologies.

While FCA does not prefer a cap, the agencies proposed a potential cap in a range of 5-10% of individual OEM fleet. FCA only supports a cap set to 10% or greater, in order to fully encourage deployment of these technologies. We acknowledge that this path works much like attribute-based standards, where it would acknowledge that a given technology could have a greater g/mi savings if the base vehicle had higher fuel consumption (i.e., a large versus small vehicle). This arrangement would also gradually taper the magnitude of the credit with time as vehicles continue to improve their fuel economy and GHG emissions performance.

The agencies also seek comment on increasing the cap to 15 g/mi. While we support any expansion of the cap, this is FCA's least preferred of the cap expanding alternatives in the proposed rule.

[65] EPA 2016 GHG Performance Report Table 3.17.

Off-Cycle Table Additions

FCA suggests additions to the predefined off-cycle technology table. The additions are proposed in two forms: transfer of approved alternative methodology applications, and adding new proposed technologies.

Transfer Approved Alternative Methodology Applications to the Table

Many OEMs have separately generated alternative methodology off-cycle technology applications for the same technology and, have had them approved. These applications represent a duplication of effort as the methodologies are generally the same and yield the same credit value. FCA proposes that many of these technologies should be standardized and added to the predefined off-cycle table technology list.

Doing so will eliminate the time spent by the agencies evaluating essentially the same application by a different OEM that ultimately will lead to the same result. An excellent example would be to add a standardized formula for high efficiency alternators based on VDA efficiency as already approved by EPA and NHTSA for Ford, GM and FCA. The agencies should standardize the calculations and add the formula to the table. Doing this will improve the process for OEMs to claim the credit as the table is the most certain and efficient way of taking credit.

FCA supports a process that would take new and approved off-cycle applications and add them to the off-cycle table. This process will free up scarce resources at both the agencies and OEMs for evaluating these technologies and speed their deployment. Implementing a process like this would take a technology proposal and, if approved, the credit would be available for use by all within a year. Given that OEMs need certainty for investment and that product decisions can take years to implement, this process is needed to incentivize the quick and widespread deployment of GHG emissions reducing and fuel saving technologies. Turning these new technologies into table items, still with appropriate agency and public review, is a winning process for all stakeholders. The agencies save time by focusing on the technical merits of the application and responding to one set of public comments. The OEMs get the needed certainty to make the investment, and the public benefits with more on-road fuel savings.

Add New Off-Cycle Technologies to the Existing Table

FCA proposes the addition of the following technologies to the predefined table:

1. High-efficiency Alternator (proposed transfer of alternative methodology for approval)
2. Efficient Electrical Device
3. Rear Axle Active Warm-up
4. Powertrain Bay Heat Retention/ Engine Encapsulation
5. Exhaust Heat Recirculation System
6. Cooled Exhaust Gas Recirculation

Supporting technical details for each of the above technologies are discussed separately in detail in Appendix 2.

Overview of a Modifications to Existing Predefined Technologies

Below are FCA's proposed modifications to the existing predefined technology table.

Technology	**Passenger Car Credit CO_2 (g/mi)**	**Light-Duty Truck Credit CO_2 (g/mi)**
High-efficiency alternator	(VDA-67) * 0.16	
Efficient electrical device	0.32 per W	
Rear axle active warm-up	1.5	3.2

Powertrain bay heat retention / engine encapsulation	1.5 (powertrain bay heat retention) 3.0 (engine encapsulation)
Exhaust heat recirculation system*	20% multiplier
Cooled exhaust gas recirculation*	10% multiplier

*Multiplier based on any combinations of active engine, transmission, or axle heating warm-up.

FCA also supports the following predefined table additions that are reviewed in detail and recommended by the Alliance:

1. Transmission by-pass valve warm-up
2. PWM-Controlled blower
3. Brushless blower motors
4. Engine Stop-Start Idle with Cold Storage

Transfer Thermal Control Technologies to the AC Efficiency Table

FCA agrees with the agencies' proposal to restructure the current off-cycle crediting structure by moving the thermal control technologies such as glass and glazing, paint, cabin ventilation, and ventilated seats to the air conditioning efficiency table. This action is supportable because all these technologies address the same underlying issue - they all work to lessen the air conditioning system load on engine and thereby reduce the accompanying energy demands.

Off-Cycle Alternative Methodology Enhancements

The agencies should use this rulemaking to address issues with the off-cycle alternative methodology approval process, and enhance it with the addition of a supplier-led approval process.

Fix the Approval Process

FCA supports all actions that would work to shorten the time it takes the agencies to evaluate and rule on alternative methodology off-cycle applications. Off-cycle application submissions can take a year or longer to be published in the Federal Register, despite the current process noted in 40 C.F.R. § 86.1869-12(d). The agencies need to identify and implement internal process improvements needed to evaluate and rule on applications in a more timely fashion.

FCA proposes that the regulations also be revised to force action if the agencies cannot maintain the timeline identified in the regulations. We propose that all off-cycle alternative methodology applications be automatically approved after 90 days if the agency has not reviewed the application for completeness or published a complete application in the Federal Register.

Without consistent, timely agency response, obtaining the needed funding to explore additional fuel saving technologies is challenging. When companies have certainty in timely agency response to off-cycle applications, more technologies can make it to market faster and on a broader scale.

Allow Supplier-Led Process

FCA also supports the Alliance proposal of allowing a supplier to lead the application process for new off-cycle or A/C efficiency technology credits as long as it is in conjunction with at least one vehicle manufacturer partner. These applications should be assessed in the same way applications submitted by vehicle manufactures are assessed.

We do not support the provisional credit concept proposal. Under that proposal, a supplier who demonstrates credit values (with a vehicle manufacturer partner) would generate credits that are available provisionally, for a limited period of time while more data is collected on the technology benefit to support continued use of the credits. This type of program get technologies designed, manufacturing facilities tooled up, and technology deployed into production, only to find that the technology does not actually achieve the benefits originally claimed by the supplier. Vehicle manufacturers need certainty that the off-cycle and A/C efficiency benefits will be granted when justifying the costs to develop technologies and put them into production.

Given the problems noted with a provisional credit option, we propose an additional option, similar to the eco-innovation program in Europe, for a supplier-led application process that would not require a vehicle manufacturer partner. Under this proposal, if a supplier is able to demonstrate a vehicle benefit at a minimum threshold of 1 g/mi for passenger cars or 1.4 g/mi for light duty trucks through the existing EPA-approved alternative methodology option, then a vehicle manufacturer partner would not be required for approval. The approved credit would then be available to any manufacturer who chooses to put the approved technology into production.

Once a technology is in production, a manufacturer would have the option to demonstrate to the agencies that their implementation of the technology actually achieves a higher benefit, and then claim a higher credit. We believe that this structure could achieve the intended goal of the problematic provisional option, but in a way that requires a more thorough vetting of the technology prior to claiming the benefit. The minimum threshold values would act to focus this application option on technologies that have a substantial benefit, thus reducing the risk of wasting agency time analyzing nuisance applications for technologies with marginal benefit. A cap for these particular credits, separate from any other credit caps, could be placed at 5 g/mi for passenger cars and 7 g/mi for light duty trucks for technologies claimed through supplier-only applications. If a vehicle manufacturer subsequently submits and receives approval of their own application for one of these technologies demonstrating a higher benefit, it would no longer exist under this cap. The combination of a minimum threshold and a cap should encourage suppliers to claim the minimum threshold value for technologies that easily over-perform the minimums. The cap proposal would limit usage to a maximum of only five technologies per vehicle approved in this manner before the cap would saturate and allow no further benefit. Setting the benefit for any given technology at the lower end of its potential creates a path for individual manufacturers to demonstrate higher actual values, thus removing them from the supplier technology cap, and creating space under the supplier technology cap to be filled with new technologies. Technologies that are being used by vehicle manufactures while they are still under the supplier technology cap will fill the same role as the provisional credit proposal, but will be part of a much more robust program that will aid in getting many more technologies with real world fuel economy benefits into production.

5 Response to Other Agency Questions

CAFE Specific Issues

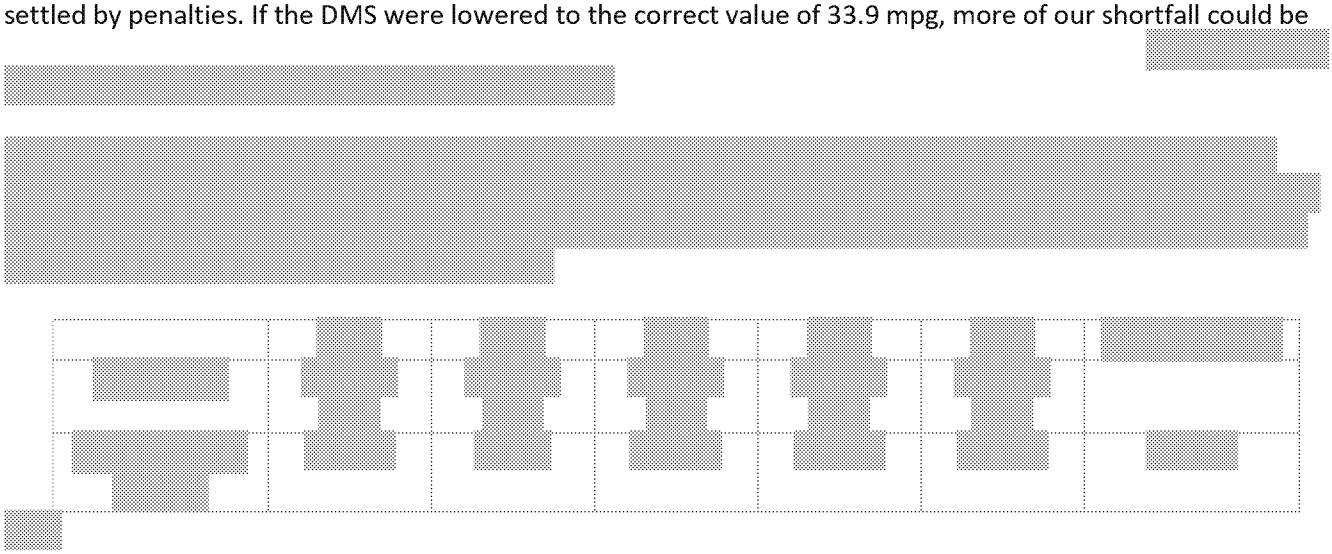
Improving the Domestic Minimum Standard (DMS)

NHTSA has been receptive to correcting the DMS. The rules in the CAFE statute for calculating the DMS are restrictive. The DMS is 92% of the average projected passenger car fuel economy determined when the standards are promulgated. NHTSA, however, makes several projections in various rulemaking sensitivity analyses. NHTSA proposes that the DMS be a range of values based on 92% of the range of projections. We assume the final DMS would be calculated when the actual value is known.

FCA supports the Alliance comments in requesting that NHTSA 1) establish a DMS range during rulemaking with a final DMS value determined at the end of the model year and 2) re-calculate the DMS at the end of the model year effective immediately.

FCA's domestic passenger car fleet is composed primarily of large cars (Chrysler 300, Dodge Charger and Challenger) and utility vehicles (Jeep Cherokee and Compass). As these vehicle types are particularly challenged by a flat standard like the DMS, we do not expect that our domestic passenger car fleet will be compliant with the DMS in the near future.

The Alliance comments show how the DMS has increased from 0.3 mpg higher than it should be in MY2012 to 1.1 mpg in MY2018. This is a financial concern for FCA because the DMS rules prevent us from using purchased credits to achieve compliance. Our only compliance option is to pay the CAFE penalties. If the DMS were corrected, however, FCA could use purchased credits for the amount of correction.
For example, in MY2016, FCA's domestic passenger car fleet achieved 31.8 mpg while our footprint standard was 35.7 mpg and the domestic minimum standard was 34.7 mpg. The difference between 35.7 and 34.7 could be resolved with purchased credit or CAFE penalties, but the difference between 34.7 and 31.8 could only be settled by penalties. If the DMS were lowered to the correct value of 33.9 mpg, more of our shortfall could be



We believe NHTSA's proposal to specify the DMS as a range starting in MY2021 is appropriate but this does not correct the error before 2021. Based on the potential savings shown here for FCA alone, we also request that NHTSA re-calculate the DMS for all model years effective immediately.

CAFE Credit Trading - Maintain Credit Trading / Market w/o Additional Reporting & Transparency.

FCA submits these comments in response to 1) NHTSA's statement that it "is considering modifying its regulations to require trading parties to submit the amount of compensation exchanged for [CAFE] credits, in addition to the parties trading and the number of credits traded in a transaction" and "is considering amending its regulations to permit the agency to publish information on these specific transactions,"[66]; and 2) NHTSA's request for comments "on whether the credit trading provisions in 49 CFR part 536 should cease to apply beginning in MY2022."[67]

FCA has concerns regarding both of these proposals. CAFE credit trading is a valuable compliance mechanism for FCA and provides added flexibility in the event unexpected circumstances arise. In addition, CAFE credit transactions between businesses should be kept confidential to protect the sensitive business practices of both parties. Accordingly, NHTSA should decline to require trading parties to submit the amount of compensation exchanged for CAFE credits, should not amend its regulations to permit the agency to publish information on these specific transactions, and should decline to eliminate the credit trading provisions in 49 C.F.R. part 536.

Credit Transaction Information

FCA first addresses NHTSA's proposals regarding credit trading information. It is important to first note that credit transactions are no different than any other sale/purchase transaction that manufacturers conduct, including those that may affect fuel economy, and should be treated no differently. For example, a manufacturer may purchase tinted windows from a parts manufacturer that it then installs in its vehicles. Such windows in turn keep vehicle interiors at lower temperatures, reducing the necessity of using air conditioning. Since air conditioning use influences a vehicle's fuel economy, this window purchase affects that vehicle's fuel economy. However, the terms of this window purchase are not made public.

Furthermore, revealing credit transaction information would reveal highly confidential business information. Credit transaction information may demonstrate the technology that is most valued by a company and the value of putting certain technology into a vehicle. This would provide highly useful information to competitors in the marketplace. For example, if Manufacturer A knows that Manufacturer B values a certain technology, it could infer that Manufacturer B has conducted market research to make such a determination. Manufacturer A would then receive the benefit of that research without conducting it itself. Or, if Manufacturer A is able to discern how it values the technology that is put into Manufacturer B's vehicle, it may be able to discern sensitive information that determines vehicle pricing.

In addition, credit trades are complex business transactions made at arm's-length. As such, they may include monetary and non-monetary compensation, non-disclosure provisions, and other sensitive terms. In other words, manufacturers compete for credits. Publicizing such sensitive information could stifle the credit market and potentially result in uncompetitive outcomes.

Both NHTSA and EPA recognize the need to keep this type of information confidential in their regulations regarding the disclosure and protection of confidential business information.[68] Requiring manufacturers to

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[66] NPRM , 83 Fed. Reg. at 43450.

[67] *Id.* at 43452.

[68] *See* 49 C.F.R. § 512.3("Commercial or financial information is considered confidential if it has not been publicly disclosed and: (i) If the information was required to be submitted and its release . . . is likely to cause substantial harm to the competitive position of the person from whom the information was obtained; or (ii) If the information was voluntarily submitted and is the kind of information that is customarily not released to the public by the person from whom it was

disclose such highly confidential business information would be contrary to these regulations which explicitly allow manufacturers to protect this information.

The NPRM's justifications for requiring the disclosure of credit transaction information are unfounded. First, the NPRM states that "[t]he lack of information regarding credit transactions means entities wishing to trade credits have little, if any, information to derive the value of the credits they seek to buy or sell."[69] But, this information is not a secret to those engaged in the buying and selling of credits. Like any purchase transaction, the buyer and the seller are aware of the terms of the purchase. If an entity wishes to trade credits, it need only enter the credit marketplace, where it can negotiate the terms of its trades. As the NPRM notes, credit balance information is public.[70] So, an entity wishing to sell credits can easily determine which manufacturers have negative credit balances and may be willing to buy, and an entity wishing to buy credits can easily determine which manufacturers have positive credit balances and may be willing to sell. Further, a vehicle manufacturer is not restricted to trading credits with just one trading partner. It may purchase credits from several different entities. Or it may sell credits to several different entities. If an entity wishing to trade credits does not feel that its credits are being properly valued by one manufacturer, it has the ability to negotiate with a different manufacturer to find terms that suit it.

Lack of public information regarding transactions is not unique to the CAFE credit context. The terms of most purchases between businesses are kept confidential. Furthermore, the financial terms of other environmental credit transactions are kept confidential. For example, while refineries must report certain information related to transfers of gasoline sulfur credits, such as the transferor's name and the number of credits transferred, they are not required to report credit transaction prices.[71] There is simply no need for the government to have this information in the regular course of business.

Second, NHTSA suggests that requiring the disclosure of credit compensation information would facilitate a transparent, efficient credit trading market.[72] FCA argues that requiring the disclosure of credit compensation information would decrease efficiency in the credit trading marketplace. It would invite comment from outside entities and persons and would inject such commentary into private business-to-business transactions. Certain transactions could receive criticism, which could make it more difficult for manufacturers to trade credits in order to meet their compliance responsibilities.

CAFE Credit Trading Elimination

The second CAFE credit trading-related issue that FCA submits comments on is the proposal to potentially eliminate the CAFE credit trading provisions beginning in MY2022.[73] CAFE credit trading is a valuable compliance mechanism for FCA and provides added flexibility in the event unexpected circumstances arise. Furthermore,

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obtained."); 40 C.F.R. § 2.201 ("Reasons of business confidentiality include the concept of trade secrecy and other related legal concepts which give (or may give) a business the right to preserve the confidentiality of business information and to limit its use or disclosure by others in order that the business may obtain or retain business advantages it derives from its rights in the information.").

[69] NPRM, 83 Fed. Reg. at 43449.

[70] *See id.* at 43449 ("NHTSA created its CAFE database to maintain credit accounts for manufacturers and to track all credit transactions. Credit accounts consist of a balance of credits in each compliance category and vintage held by the holder."); *see also* CAFE PUBLIC INFORMATION CENTER: CREDIT STATUS REPORT, https://one.nhtsa.gov/cafe_pic/CAFE_PIC_Credit_LIVE.html (May 31, 2018) (publishing credit status reports by manufacturer, fleet, and model year).

[71] *See* 40 C.F.R. § 80.16115-16 *et seq.*

[72] *See* NPRM, 83 Fed. Reg. at 43449–50.

[73] *See id.* at 43452.

manufacturers such as FCA have relied on the availability of the credit trading program to make business decisions. The program is intertwined with compliance and the CAFE standards themselves. It is also necessary for the efficient deployment of technology and allows for consumer choice and the evolving structure of the automotive industry.

A. Detrimental Reliance on the Credit Trading Program.

FCA first notes that manufacturers have relied on the certainty of the credit trading program to make major business decisions and investments, including with respect to fleet structuring. Removing it now would significantly disrupt these long lead time plans. The CAFE credit trading program was established nearly ten years ago and was implemented beginning in Model Year 2011.[74] Since then, there has been no indication that the credit trading program was in danger of being eliminated. Thus, manufacturers relied on this program to make major business decisions, which now may have been to their significant detriment. For example, the availability of credit trading influences not only the types of vehicles to manufacture, but also which technologies to invest in, how to invest, and how to structure expenditures on development.

Second, it is not possible for manufacturers to quickly build up technology that would have to be implemented to reach compliance in the absence of credit trading options. As described above, product planning may take years. Environmental regulators recognize the difficulty, in terms of timing, of developing such technology. For example, in its ZEV regulations, CARB used phase-in requirements under which only a certain percentage of a manufacturer's fleet was used to determine the manufacturer's overall ZEV requirement (34% in MY2008, 51% in MY2009, 68% in MY2010, 85% in MY2011, and 100% in MY2012 and thereafter).[75] This is indicative of the fact that significant lead time was necessary for manufacturers to build up to full compliance with the ZEV requirements.

The impossibility of immediately developing and implementing enough technology to create a compliant fleet if the credit trading program is eliminated may result in manufacturers failing to meet targets for years to come. This failure would not, however, be the fault of the manufacturers. It would simply be the result of reasonable reliance on the availability of credit trading as a long-standing part of the CAFE program.

B. The credit program and CAFE compliance are intertwined.

It would be antithetical to the compliance approach of the CAFE program to eliminate credit trading. The CAFE standards are not set based on an assumption that every manufacturer will be able to comply with them. NHTSA knows that certain manufacturers produce fleets that are compliant with the standards or that are overly-compliant. NHTSA also knows that certain manufacturers produce fleets that will not meet the standards and will choose to comply using one or more flexibilities. The standards are thus set knowing that compliance flexibilities exist—namely, the credit program and the option of paying a fine to maintain compliance.

The credit program ensures that the entire US fleet, as a whole, is compliant. In terms of the fuel economy of the US fleet, it matters not whether the fleet is compliant because of one manufacturer's vehicles or whether the fleet is compliant because of one manufacturer's vehicles combined with credits from an over-compliant manufacturer. As explained further below, the removal of the credit trading program merely disrupts certain individual manufacturers.

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[74] *See* Average Fuel Economy Standards Passenger Cars and Light Trucks Model Year 2011, 74 Fed. Reg. 14196 (Mar. 30, 2009).

[75] 13 C.C.R. § 1962(b)(1)(C); 13 C.C.R. § 1962.1(b)(1)(C).

The availability of market-based compliance flexibilities is not unique to the CAFE program. EPA publicly acknowledges the importance and necessity of such approaches:

> For some air pollution problems (e.g., acid rain, ozone layer protection, vehicle emissions, certain stationary source programs involving common pollutants), the Clean Air Act mandates or allows market-based regulatory approaches. Companies that achieve extra pollution reductions can trade or sell emission credits to other companies - typically, those that face higher costs to control pollution. Well-designed market-based regulatory approaches, properly targeted to the problem at hand, *can achieve greater emissions reductions at less cost and provide incentives for technology innovation*.[76]

C. The credit program and CAFE standards are intertwined.

The credit trading program does not stand on its own. It is inextricably intertwined with the CAFE standards. If the credit trading program is eliminated, but fundamental changes are not made to stringent fuel economy standards, it will be substantially more difficult for some manufacturers to achieve compliance. Further, even if fuel economy standards are revised, in the event that such an action is challenged, manufacturers may find themselves in a state of limbo while a court case proceeds.

Again, manufacturers cannot simply make changes to their vehicle fleets or to the technology contained therein at any time in order to ensure that their fleet meets CAFE standards. Manufacturers need lead time to design fleet profiles. As described in Section 2.5.1, it takes 2 to 4 years to introduce a new product considering primary funding, design, development, and implementation. Under the current CAFE program, this type of product planning necessarily involves accounting for whether credits will be available. If credits will be available for trading, it influences the number and type of vehicles that will be produced. If the CAFE credit trading program is in a state of uncertainty, however, manufacturers will be unable to effectively plan for future model year fleet composition.

D. Credit trading is necessary due to unexpected developments.

Credit trading is also necessary due to unexpected developments, such as changes in the marketplace and setbacks in development and production. As noted in the MTE and throughout these comments, previous marketplace assumptions were incorrect or have changed. Sales of electrified vehicles have decreased, there is uncertainty regarding the pace of development of new technologies and the degree of efficiency improvements they will ultimately be able to deliver, and there has been a lack of acceptance of new technologies by consumers (in part due to low gas prices).[77]

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[76] *Building Flexibility with Accountability into Clean Air Programs*, EPA (last updated Feb. 16, 2017), https://www.epa.gov/clean-air-act-overview/building-flexibility-accountability-clean-air-programs (emphasis added) (providing the following examples of flexibility in clean air programs: harnessing market incentives to reduce acid rain, harnessing market incentives to reduce interstate pollution, harnessing market incentives to protect the ozone layer, designing flexible, cost-effective standards for cleaner vehicles, providing flexibility in national emissions standards for industrial facilities, allowing flexible air permits); *see also* Markus W. Gehring & Charlotte Streck, Envtl. Law Inst., *Emissions Trading: Lessons From SOx and NOx Emissions Allowance and Credit Systems Legal Nature, Title, Transfer, and Taxation of Emission Allowances and Credits*, 35 ELR 10220, 10220 (2005), https://www.gppi.net/fileadmin/user_upload/media/pub/2005/Streck_2005_Emissions_Trading.pdf ("Emissions trading is increasingly recognizes as a cost-effective policy instrument to reduce the concentration of greenhouse gases (GHGs) in our atmosphere. The concept, which until recently was treated with suspicion by many countries, has seen in the last 12 months unprecedented proliferation and success.").

[77] *See* Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light-Duty Vehicles, 83 Fed. Reg. 16077, 16079–83 (April 13, 2018).

All of these market influences may contribute to a manufacturer's inability to meet the CAFE standards based on its own fleet composition. That is, if a manufacturer is unable to sell as many electric vehicles as it anticipated, or if consumers are less interested in fuel efficient vehicles due to low gas prices, the assumptions made by a manufacturer in planning for fleet composition—which occurs many months before model year production begins, which in turn begins months before the calendar year—may have been incorrect. The availability of credit trading allows flexibility to adjust to these changing market conditions. Likewise, credits can be used as a mechanism to help offset unexpected setbacks in vehicle development and manufacturing. Credit trading allows manufacturers to remain in compliance despite unanticipated developments outside of the control of the manufacturer.

E. Eliminating credits creates economic inefficiency.

The credit trading program encourages economic efficiency by lowering the overall cost of reducing fuel use. It creates a benefit for manufacturers with low costs to exceed the standards and generate additional revenue from the sale of credits. If the credit trading program is eliminated, those manufacturers that currently design their fleets to exceed the standards—and therefore are able to generate and sell credits for a profit—may instead choose to produce fleets that simply meet the standard.

F. Credit trading allows for consumer choice.

Consumer preferences vary greatly with respect to the type of vehicle that is desired. Some, such as those who live in urban areas may prefer vehicles that tend to be more fuel efficient. Others, such as those who must transport heavy loads or who drive over rough terrain, may prefer more capable vehicles. As the NPRM notes, "[d]espite the widespread availability of fuel economy information, and despite manufacturers building and marketing vehicles with higher fuel economy and increasing their offerings of hybrid and electric vehicles, in the past several years as gas prices have remained low, *consumer preferences have shifted markedly away from higher-fuel-economy smaller and midsize passenger vehicles towards crossovers and truck-based utility vehicles*."[78]).

The credit trading system allows manufacturers to produce more capable vehicles, which the public is demanding, while still complying with fleet average standards that further the goal of fuel conservation across the entire U.S. fleet. Without the ability to trade credits in order to meet compliance standards, manufacturers may be unable to produce such vehicles despite consumer demand. Thus, many consumers will be deprived of their choice of vehicle.

G. The credit trading program is essential due to the current nature of the vehicle manufacturing industry.

When the fuel economy program was first introduced in the 1970s, vehicle manufacturers did not tend to specialize in producing specific types of vehicles. Over the decades, however, the market has matured and the automobile industry has changed significantly. Now, many manufacturers do in fact tend to specialize in terms of the types of vehicles they produce (or in the majority of the types of vehicles that are produced and sold). FCA, for example, produces numerous vehicles with exceptional off-road and hauling capability, such as Jeeps and Rams, whereas other manufacturers may specialize in vehicles that lend themselves to higher fuel economy or electrification. The regulations have taken into account this economic reality by allowing for the trading of credits between two such manufacturers, while still conserving fuel industry-wide. The lack of a credit trading program would calcify an industry profile that no longer exists. This would cause dramatic marketplace disruption by forcing the industry back into this bygone era.

[78] 83 Fed. Reg. at 42993 (emphasis added).

The GHG and CAFE programs already disproportionately harm manufacturers who specialize in capable vehicle manufacturing. For example, manufacturers were allowed to preemptively bank credits in model years 2009 through 2012 in advance of implementation of the 2012 standards. Those manufacturers who already produced fleets that, on average, were more fuel efficient were greatly advantaged by this process. They had the ability to bank a substantial number of credits which they could later trade for a profit or use as a fallback to offset future credit deficits incurred as a result of fleet changes. This disadvantaged those manufacturers, such as FCA, which tend to specialize in consumer-oriented, capable vehicles.

Such manufacturers continue to be disadvantaged with respect to GHG and CAFE compliance due to the nature of their fleets. Given that economic freedom is still tied into the regulatory scheme—that is, the agencies do not purport to restrict the specific types of vehicles that may be produced and sold in the United States—and given that more capable vehicles are increasingly popular with American consumers, the credit trading program is a necessary element of the GHG and CAFE compliance programs. Unless the agencies are prepared to force consumers to only buy certain vehicles, manufacturers must be free to respond to market demands. Notably, FCA does not argue that manufacturers should be free to produce vehicles based on consumer demand with complete disregard for the GHG and CAFE standards. It merely argues that the CAFE credit trading program should continue to exist to allow such manufacturers to continue to meet consumer preferences.

Further, it should be noted that at its inception, the CAFE program was concerned with energy security. Such issues are no longer present.[79] Rather, the CAFE program, along with the GHG program, is now more concerned with fuel conservation and the effects on the environment of burning fuel. Again, regardless of whether a manufacturer achieves compliance through credits or through its own fleet profile, the same amount of fuel is consumed. The elimination of credit trading does not translate to a necessary decrease in fuel consumption. Those manufacturers that currently generate credits and reap a significant profit could find that, in the absence of a credit program, it would be more profitable to begin producing less fuel efficient vehicles, which the agencies themselves have acknowledged are popular with consumers. As a result, the net fuel consumed would not necessarily decrease industry wide with the elimination of credit trading.

II. If CAFE credit trading is eliminated, traded GHG credits should count towards CAFE compliance.

The preceding sections represent FCA's primary positions—CAFE credit transactions should not be made public and the CAFE credit trading program should continue to exist. FCA includes the following comments for consideration should NHTSA choose to eliminate the CAFE trading programs.

EPA is not considering eliminating the GHG credit trading program. Therefore, GHG credits will continue to be traded between manufacturers. Credits for both programs, however, may be generated through the same technology. That is, given the equivalency between CO_2 and fuel economy, if a manufacturer's fleet conserves CO_2 emissions and generates CO_2 credits, then it also likely conserves fuel and generates fuel economy credits, and vice versa. Similarly, the same specific technology may be used to earn both GHG and fuel economy credits:

> to achieve the level of standards described in [the] final rule for the 2017–2025 program, NHTSA expects automakers to continue increasing the use of innovative and advanced technologies as they evolve. . . . These incentive programs for CAFE compliance are not under NHTSA's EPCA/EISA authority, but under EPA's EPCA authority— . . . EPA measures and

[79] *See id.* at 42993 ("The U.S. is now the world's largest oil producer and expected to become a net petroleum exporter in the next decade.") (citing Annual Energy Outlook 2018, U.S. Energy Information Administration, at 53 (Feb. 6, 2018), https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf.).

> calculates a manufacturer's compliance with the CAFE standards, and it will be in the calculation of fuel economy levels that the additional incentives are applied. Specifically, what is being finalized in the CAFE program, as proposed by EPA: 1) Fuel economy performance adjustments due to improvements in air conditioning system efficiency; 2) utilization of "game changing" technologies installed on full size pickup trucks including hybridization; and 3) installation of "off-cycle" technologies.[80]

Therefore, a manufacturer that has made an investment in such technology is able to essentially receive double payment for that investment. This is an anomaly of the dual existence of the GHG and CAFE programs.

If CAFE credit trading is eliminated, which, to be clear, FCA advocates against, GHG credits earned and traded should also count for CAFE compliance. There is a mathematical equivalence between CO_2 emissions and fuel economy. It makes little sense that a credit earned for a piece of technology that reduces fuel consumption and therefore reduces CO_2 emissions should only be applied to one program. Allowing a GHG credit to be applied to CAFE compliance eliminates the aforementioned anomaly and eliminates the double payment that manufacturers who develop such technology may receive.

Previous Harmonization Requests
NHTSA has tentatively denied the Alliance/Global's petition to include off-cycle credits for MY2010-2016. When off-cycle credits (or FCIVs) were added to the CAFE program for MY2017-2025, NHTSA declined to retroactively add these credits to the MY2012-2016 program stating that they did not take them into account when adopting the CAFE standards for those model years.[81] The suggestion is that if NHTSA had included them, they could have made the standards more stringent.

We note, however, that EPA *did* consider off-cycle credits for MY2012-2016 and concluded that there wasn't sufficient information to include them in their stringency. There is no practical difference between NHTSA not considering off-cycle credits for stringency and EPA considering them but assigning them a value of zero. Therefore, the Alliance believes that NHTSA would not be retroactively violating its requirement to promulgate maximum feasible standards.

We note that off-cycle credits are for technologies that provide real fuel savings, can be included in average fuel economy with the fuel consumption improvement values as is done for MY2017-2025, and would further harmonize the programs.

Similar arguments are applicable to A/C efficiency credits. This subject is a somewhat more complicated than off-cycle credits because EPA did add A/C efficiency credits to their stringency. It is for this reason that the Alliance/Global petition only sought credits in the CAFE program for exceeding the assumed credits used to determine the GHG stringency. In other words, had NHTSA considered A/C efficiency credits when determining maximum feasible, and had they used the same level of credits that EPA assumed, they would have promulgated standards that were higher than used in MY2012-2016. But under the mechanisms described in the petition, manufacturers would only earn credits for exceeding that higher level of stringency.

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[80] 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62623, 63125 (Oct. 15, 2012).
[81] *Id.* at 43456 (citing 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62840 (proposed Oct. 15, 2012).

NHTSA has also tentatively denied the Alliance/Global petition request to adjust VMTs for MY2011-2016. We note that the purpose of One National Program was for NHTSA to consider fuel savings and for EPA to consider GHG emission for the same set of vehicles. These vehicles drive a certain number of miles over their lifetime and it does not make sense that NHTSA's program consider the fuel savings over fewer miles. Further, we disagree that a MY2011 vehicle would drive 23% fewer miles in its lifetime than a MY2017 vehicle. The practical solution for MY2012-2016 is the same as NHTSA assumed for MY2017-2025. That is to equate the VMT to EPA's values. The Alliance believes there would be minimal harm in this action because manufacturers were generally CAFE compliant during this time frame.

Classification

Attribute-Based Standards Work Because They Adjust to Consumer Demand

FCA supports the existing footprint-based structure of the standards as they allow the market to determine which size of vehicles to purchase, but encourage each vehicle to be fuel efficient for its size. In the MY2012-2016 final rule, the agencies noted:

> *[T]he shapes of the curves, including the "flattening" at the largest footprint values, tend to avoid or minimize regulatory incentives for manufacturers to upsize their fleet to change their compliance burden. Given the way the curves are fit to the data points (which represent vehicle models' fuel economy mapped against their footprint), the agencies believe that there is little real benefit to be gained by a manufacturer upsizing their vehicles.*[82]

FCA agrees with the agencies conclusion that the footprint-based approach to standards that have been in use since MY2011 (and optional for MY2008-2010 light duty trucks) do not provide an incentive to upsize vehicles. However, some argue that backstop standards are needed for the Import Car (IC) and Light Duty Truck (LDT) fleet to avoid larger vehicles. In the MY2017-2025 rule NHTSA further noted that:

> *If we determined that backstops for imported passenger cars and light trucks were necessary, it would be because consumers are choosing different (likely larger) vehicles in the future than the agencies assumed in this rulemaking analysis. Imposing additional backstop standards for those fleets would require manufacturers to build vehicles which the majority of consumers (under this scenario) would presumably not want. Vehicles that cannot be sold are the essence of economic impracticability, and vehicles that do not sell cannot save fuel or reduce emissions, because they are not on the roads, and thus do not meet the need of the nation to conserve fuel.*[83]

NHTSA's argument that a backstop standard could force manufacturers to build vehicles that consumers do not want is sound, and for this reason the FCA is also opposed to backstop standards. Fortunately, since MY2012 there has been ample time to assess whether manufacturers have intentionally designed larger footprint vehicles, the primary concern driving requests to implement backstop standards. Novation Analytics recently published "Model Years 2012 to 2018 Baseline Studies" which includes a comparison of footprint data by fleet and model year, revealing essentially no change in footprint, see Figure 38.

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[82] Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25324, 25369 (May 7, 2010).
[83] 77 Fed. Reg. at 63022.

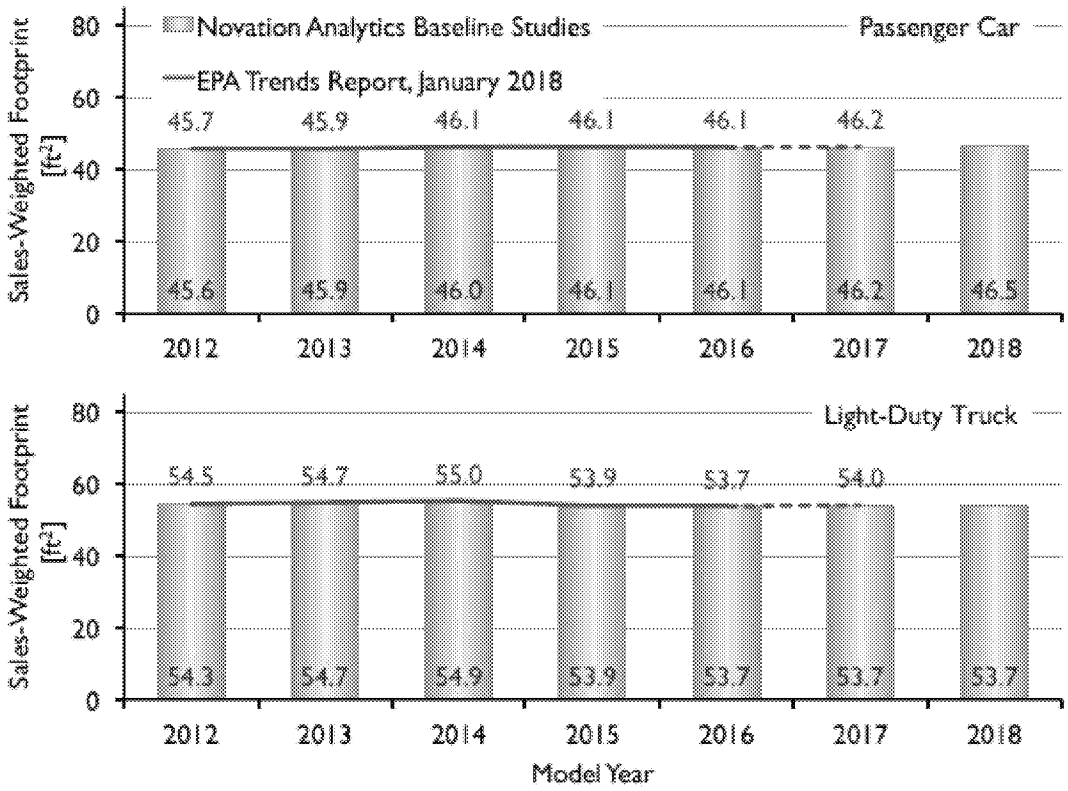

Figure 38: Novation Analytics Footprint Analysis[84]

CARB also analyzed footprint trends in the midterm review and they observed that:

> *The largest influence appears to be a higher share of truck sales that generally have a larger footprint than cars rather than a significant increase in the average footprint within the car or truck segment itself.*[85]

CARB's conclusion is consistent with the Novation Analytics analysis which also shows that the small shift in footprint is due to changing market mix towards trucks, versus earlier concerns voiced by others that manufacturers would simply build larger vehicles. The consistency of footprint within each segment and the mix shift, primarily from Cars to Truck SUVs can be seen in Figure 39.

[84] Novation Analytics, Model Years 2012 to 2018 Baseline Studies v1.1, p. 23, October 8, 2018

[85] California Air Resources Board, *California's Advanced Clean Cars Midterm Review*, ES-24, (Jan. 18, 2017), *available at* https://www.arb.ca.gov/msprog/acc/mtr/acc_mtr_finalreport_full.pdf.

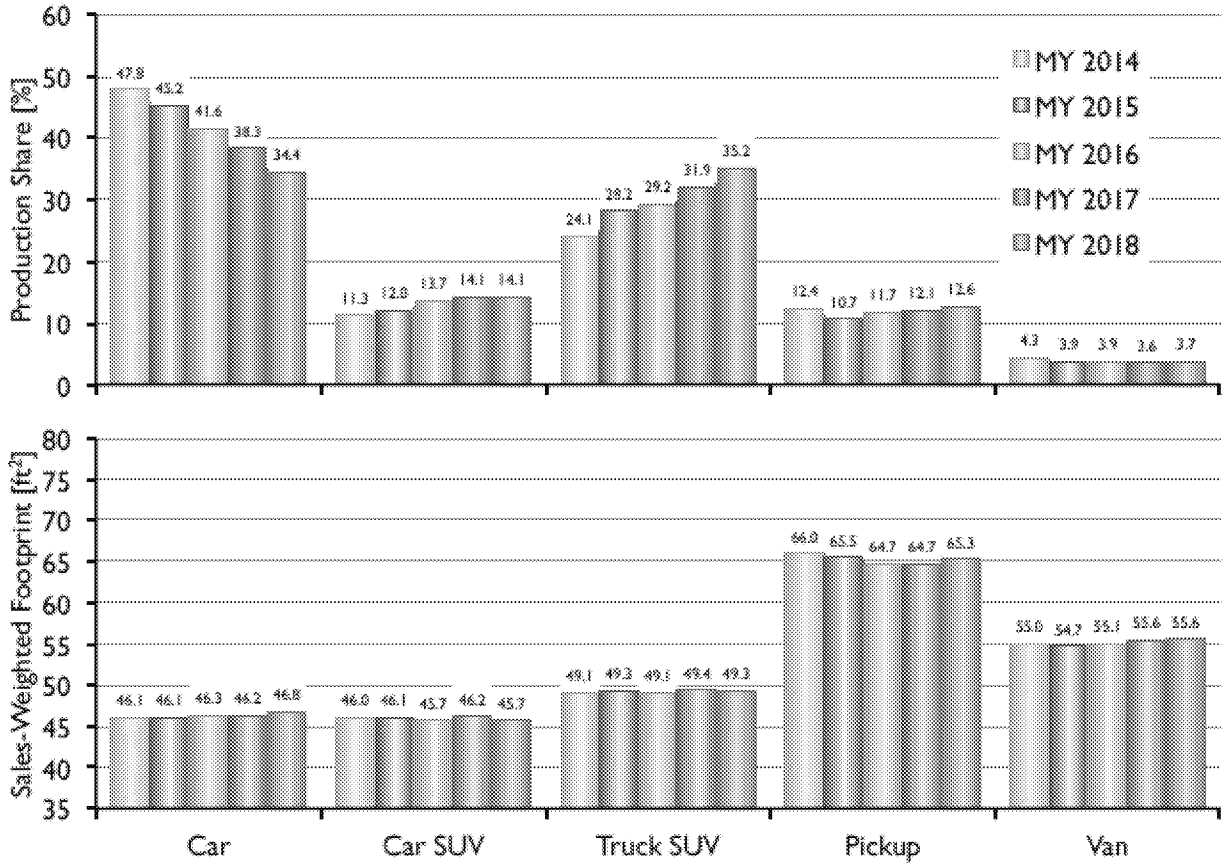

Figure 39: Production Share and Footprint by Segment[85]

There is no "Gaming" with current footprint-based standards

While consumer preference has changed regarding the types of vehicles demanded, the footprint in each of the segments has remained relatively constant. The data above shows there are no systemic footprint increases (or any type of target manipulation) occurring. This simply confirms that the agencies footprint-based standards are an effective attribute for establishing GHG and fuel economy requirements in the Light Duty Vehicle segment. Given the consistency of footprints over time, there is no reason to pursue consumer choice limiting backstop standards that would undermine the purpose of footprint-based standards.

As reported in the Novation Analytics Baseline Study, the production share of Cars has been dropping while the share of Car SUVs and Truck SUVs has been expanding (Figure 39: Production Share and Footprint by Segment). The "Car" category remains the largest portion of the PC fleet (73% in MY2017). The Truck SUV category has also been increasing, and remains the majority share of the LDT fleet (67% in MY2017).

[86] Novation Analytics, Model Years 2012 to 2018 Baseline Studies v1.1, p. 24, October 8, 2018

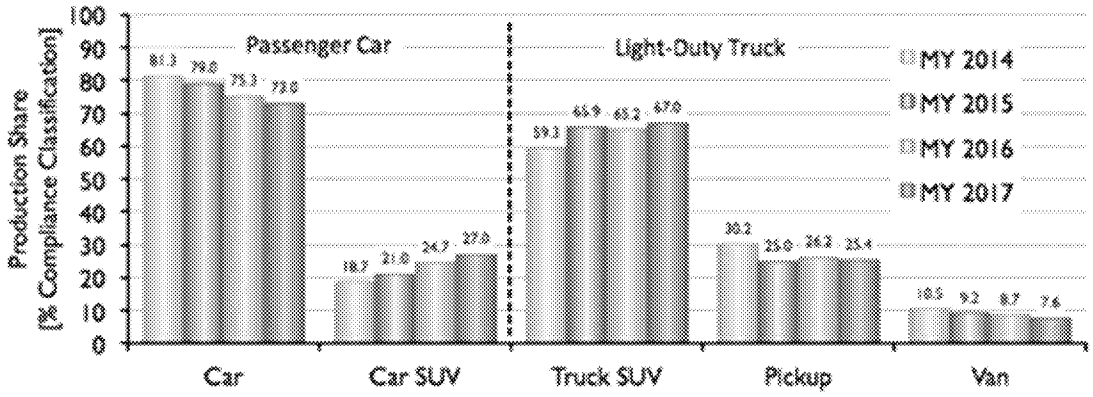

Figure 40: Passenger Car and Light Duty Truck Production Share[87]

Removing the "mix shift effects" from footprint analysis

To further demonstrate this point, industry compliance was analyzed for MY2014-2017 with segment mix and size held constant at the MY2014 level. As shown in Figure 41, the PC fleet would have performed 3 g/mi better in MY2017, relative to its standard, if the fleet mix had remained constant from MY2014. Since Car and Car SUVs have similar footprints (reference Figure 39: Production Share and Footprint by Segment), the footprint standards would not have changed. However, with a lower share of Car SUVs, the tailpipe CO_2 would have been 3 g/mi lower.

Conversely, the same type of analysis on the LDT fleet shows the impact is nearly zero. In this case, the shifts in share yielded a more stringent footprint standard (due to the smaller footprint of the Truck SUV). However, the Truck SUVs have lower tailpipe CO_2 compared to Pickups and Vans. Consequently, the increased stringency due to the increased share of smaller trucks was offset by lower tailpipe CO_2 of the smaller trucks; effectively what the footprint standards were meant to accommodate. For MY2017, the footprint standard would have been 3 g/mi less stringent (298 g/mi vs. 295 g/mi) had the vehicle category shares remained constant, but the tailpipe CO_2 would have been 3 g/mi higher which yields a near zero change in compliance.

[87] Source: Novation Analytics, personal communication to Alliance of Automobile Manufacturers.

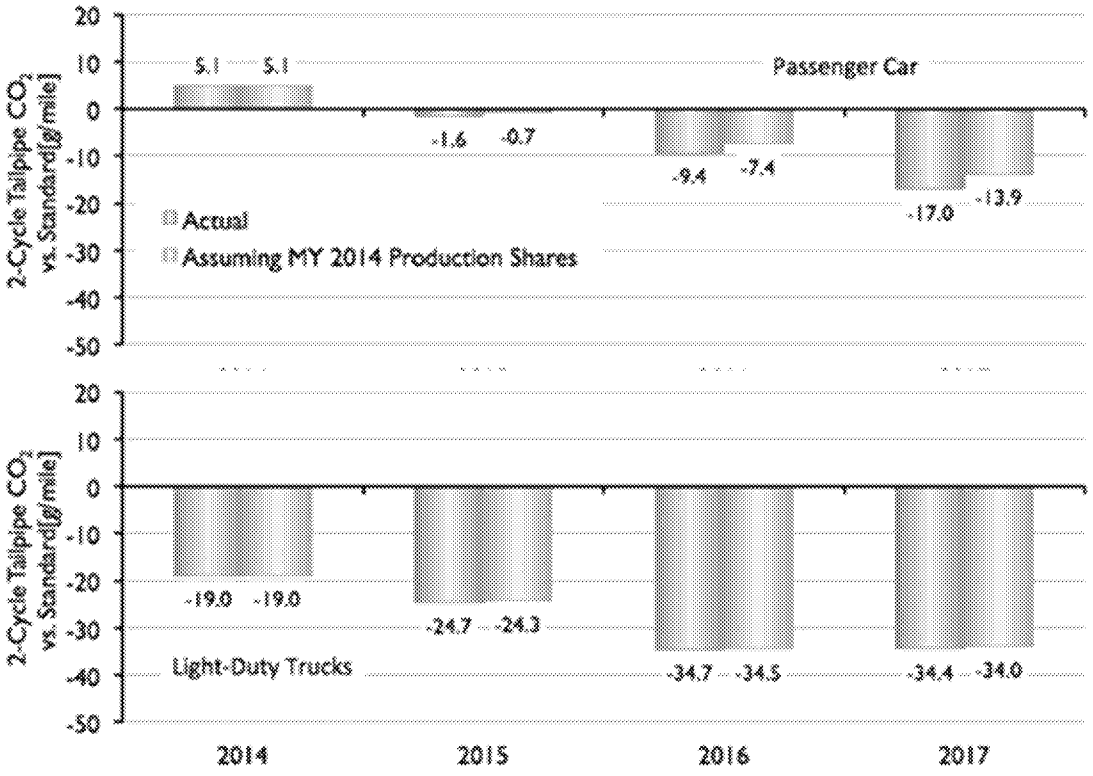

Figure 41: CO_2 Compliance with MY2014 Production Share[88]

Compliance Burden by Segment (Classification is working except for 2WD UVs)

The current vehicle classifications, except for the inclusion of small 2WD SUVs in the Passenger Car fleet, are appropriate. All vehicles currently in the Light-Duty Truck fleet, plus the 2WD SUVs currently in the Passenger Car fleet, have truck-like characteristics. As required by EPCA/EISA passenger cars and light trucks are subject to different standards consistent with their different capabilities. Some have expressed concern that vehicles in the truck fleet are not sufficiently challenged by the standards and should be in the car fleet. This is completely incorrect. Since 2012, the small 2WD SUVs and the light duty truck fleet have been the most challenged segments to comply with the rule, even while comparable fuel-saving technologies continue to be implemented across the fleet.

Vehicles with Truck Features are "Over-Tasked"

CO_2 performance-to-standard by category is shown in Figure 42. Car SUVs, Truck SUVs, Pickups, and Vans have all been worse than standard from MY2014-2017. For the PC fleet, an increasing share of Car SUVs has negatively impacted the compliance situation, which demonstrates that increasing consumer demand for this segment has a disparate compliance impact for manufacturers of these vehicles. On the other hand, for the LDT fleet, an increasing share of Truck SUVs versus pickup trucks will not necessarily impact the compliance situation because all of these segments are challenged to comply.

[88] *Id.*

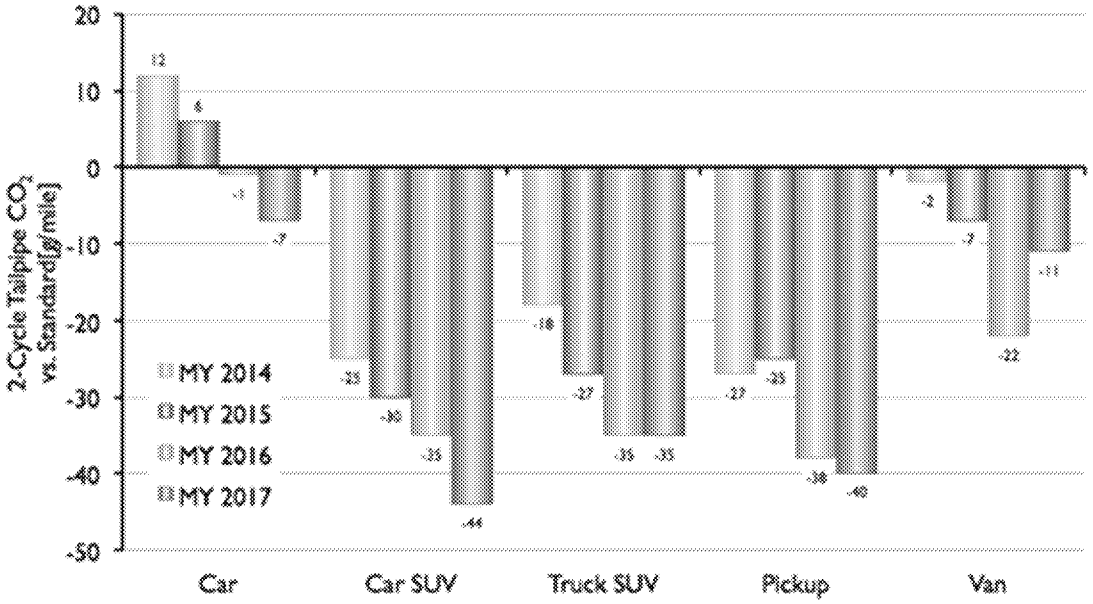

Figure 42: CO_2 Performance-to-Standard[89]

This next chart, Figure 43, shows the CO_2 performance-to-standard weighted by production. That is, the overall compliance contribution to industry's combined fleet performance.

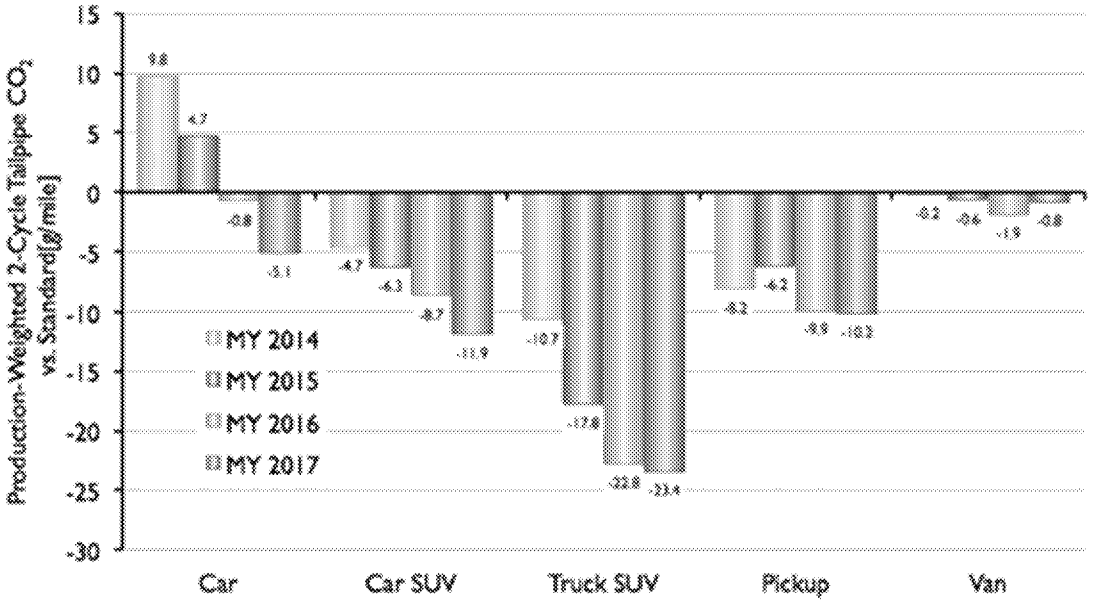

Figure 43: Production Weighted CO_2 Performance-to-Standard[90]

[89] *Id.*
[90] *Id.*

All evidence demonstrates that the current vehicle classification system challenges all of the vehicle segments. As can be seen, the Car and Truck SUVs are the largest deficit generators to industry compliance, but their growing popularity clearly shows that these are the types of vehicles that consumers are demanding.

Technology is being added to UVs at a rate exceeding PCs

Some might question whether this compliance challenge is a sign that the industry failed to apply technology to the small 2WD SUVs and LDT truck fleet, but this is not the case. As seen in EPA's 2017 Fuel Economy Trends data shown in Figure 44 below, Car and Truck SUVs improved by 43 g/mi (12.7%) and 45 g/mi (11.3%) respectively. In this same timeframe passenger cars improved by only 19 g/mi (6.3%).

	Car (non-SUV)		Car SUV		Pickup		Truck SUV		Minivan/Van	
Model Year	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)
2012	27.6	322	23.3	381	17.2	516	20.0	445	21.3	418
2013	28.4	313	24.3	365	17.5	509	20.8	427	21.1	422
2014	28.4	313	24.4	364	18.0	493	21.6	412	21.3	418
2015	29.0	306	25.1	353	18.8	474	21.9	406	21.8	408
2016	29.2	303	26.2	338	18.9	471	22.2	400	21.7	410

Figure 44: EPA FE Trends Fuel Economy and CO_2 by Segment[91]

Vehicle Energy Efficiency is Consistent Across Segments

Another way of looking at the appropriateness of the vehicle classifications is to evaluate whether the vehicles in the various vehicle segments are relatively equally efficient given the differences between the segments. The vehicle efficiency can be assessed with a metric called tractive efficiency. Tractive efficiency compares the fuel efficiency (in fuel energy consumed divided by drive cycle distance) emitted vs. vehicle tractive energy (energy required to move the vehicle through the drive cycle divided by drive cycle distance). Figure 45 below reveals that all vehicle segments all have similar levels of efficiency, though small 2WD SUVs are the most efficient.

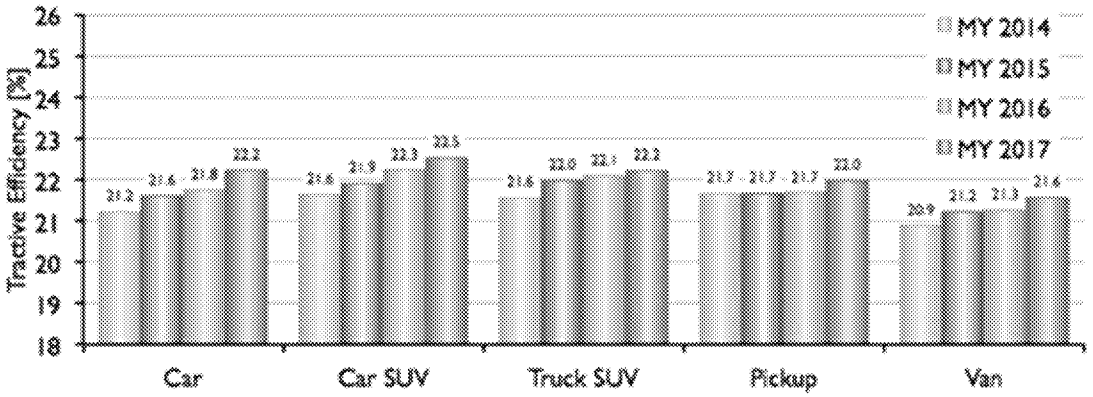

Figure 45: Tractive Efficiency by Segment[92]

Unfortunately, the compliance burden by segment shown in Figure 42, is misaligned with the underlying physics shown in Figure 45. The agencies are imposing more stringent standards on the truck fleet. The small 2WD UVs that fall in the car fleet are also penalized. The agencies need to correct this disparity in current rulemaking

[91] EPA 2017 FE Trends Report at 22.

[92] Novation Analytics, personal communication to Alliance of Automobile Manufacturers.

when resetting footprint curve standards. Moving the small 2WD UVs back to the truck fleet, by updating NHTSA's vehicle classification to recognize the truck-like characteristics of these vehicles, is a logical solution.

Truck-Like Characteristics & Off-Road Capability Attributes for Vehicle Classification

NHTSA raises a number of questions in the proposed rule regarding vehicle classification, with respect to truck-like characteristics and off-road capability. FCA fully supports the Alliance comments and offers the following additional information:

Truck-Like Characteristics

One path to determine that a vehicle is a non-passenger automobile is through identification of vehicles that have expanded use for cargo carrying purposes.[93] To confirm the expanded use, the forward most point of installation of the second row of seats must be established. This is normally the forward most attachment of the seat structure to the vehicle floor. NHTSA seeks comments on how to identify the "forward most point of installation" for second row seats that are sliding. We feel the forward most attachment of seat structure to the floor is still a viable method even when there is a sliding track between the floor attachment point and the seat.

Also, the agency observes that "...the market demand for increased rear seat leg room and the installation of rear seat air bag systems has resulted in the introduction of adjustable second row seats..."[94] and that the "..seats provide adjustable leg room by sliding forward or backward on sliding tracks and aim to provide expanded cargo carrying room by moving forward against the back of the front seats."[95] In consideration of this, we propose that the seat attachment to the sliding track is an acceptable additional method for determining forward most point of installation. This assessment should occur with the seat in any manufacturer designated fore-aft seat position. We feel that this expanded determination of the installation point for sliding seats allows for customer demanded comfort and safety, while still meeting the spirit of the expanded cargo carrying requirement.

NHTSA also asks whether it should establish a minimum amount of cargo surface area for seats that remain in the vehicle or a minimum amount of useable cargo-carrying volume when the seats fold flat. FCA does not believe that area or volume requirements are needed as those attributes speak to overall vehicle size and shape which should remain a consumer choice. We feel that the requirements for expanded cargo or other non-passenger-carrying purposes are fully met with the existing regulation, which requires a flat, leveled cargo surface with two rows of seats that are folded or stowed.

Other questions NHTSA poses are as follows
:

- Does the cargo surface need to be flat and level in exactly the same plane, or does it fulfill the intent of the criterion and provide appropriate cargo-carrying functionality for the cargo surface to be other than flat and level in the same plane?
- Does the cargo surface need to be flat and level across the entire surface, or are (potentially large) gaps in that surface consistent with the intent of the criterion and providing appropriate cargo-carrying functionality? Should panels to fill gaps be required?

We attempt to minimize any significant steps/breaks and gaps in the cargo surface which is what our customers want. However, we feel all OEMs should be allowed to determine the methodology for providing appropriate

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[93] 49 C.F.R. § 523.5(a)(5).
[94] 83 Fed. Reg. 43438.
[95] *Id.*

cargo-carrying functionality without NTHSA stipulating additional requirements for flat and level, or gaps and gap filling panels. These potential requirements would likely be interpreted and executed differently across OEMs and could narrow the choice of engineering solutions and negatively affect other important vehicle attributes.

Off-Road Capability

Measuring Vehicle Characteristics

NHTSA asks whether rules should be modified to allow design data instead of physical measurements for manufacturer determination of the five characteristics (approach angle, breakover angle, departure angle, running clearance, and axle clearance) indicative of off-highway operation. Design data should be allowed because vehicle design is now conducted in a virtual world and physical prototypes are often not produced until relatively close to production. Vehicle classification is considered at the beginning of our vehicle program design process in a virtual environment, and is intentionally achieved in the final product. The existing rules allowing only for physical measurements made sense in the time before digital designs were common place. At that time there was less control over vehicle tolerances, and there were many more prototype vehicle phases to confirm many aspects of a design including off-road capability. Now that a significant portion of vehicle attributes are validated in the virtual world, it only makes sense that NHTSA allow manufacturers to provide design data as confirmation of off-road capability.

Approach, Breakover, and Departure Angles

The NPRM questions whether there is need to change from static loaded radius arc to one of two new proposals for determination of approach, breakover, and departure angles. The proposed alternatives are either 1) a line tangent to the outside perimeter of the tire, or 2) a line tangent from the geometric center of the tire contact patch. While the proposed alternatives may be easier for a field measurement, only a measurement from the static loaded arc radius reasonably reflects the tire condition during off-road events that approach, breakover, and departure angles are quantifying. For example, when approaching an off-road obstacle such as a rock, the most challenging condition will be the moment when the tire contacts the obstacle and starts to conform to the obstacle. In this situation, the static loaded arc radius best reflects the actual condition that exists versus outside tire diameter (under represents the challenge) or center of contact patch (over represents the challenge). As noted by NHTSA in the proposed rule, "[t]he static loaded radius arc is easy to measure,"[96] and FCA agrees. It is also easily modeled in vehicle designs which we rely upon, therefore we request that the off-road criteria remain tied to the static-loaded arc radius.

Running Clearance

NHTSA identifies concerns regarding running clearance with fixed and flexible components. FCA agrees with the agency that no change is needed for 20cm running clearance requirement of fixed features of the vehicle – all fixed components must have 20cm of running clearance. We further agree with NHTSA's interpretation that flexible components which bend without breaking and return to their original position do not count against the 20cm running clearance requirement. NHTSA notes these requirements should be for all "...vehicles with standard and optional equipment installed, at time of first retail sale."97 FCA disagrees with the first retail sale requirement and proposes that it be as shipped to the dealer. Our dealers are independent franchisees and may negotiate with the final customer to install additional equipment on the vehicle, for which FCA cannot be held responsible. We further note that NHTSA should make specific allowance for vehicles which have adjustable

[96] *Id*. at 43439.
[97] *Id*. at 43440.

ride height, such as air suspension, and permit the running clearance and other off-road clearance measurements to be made in the lifted or off-road mode.

Front and Rear Axle Clearance

In the NPRM NHTSA highlights a concern with axle clearance measurements due to the shift from solid axles to independent suspension. NHTSA seeks comments on whether to revise the axle clearance definition. Axle clearance means the vertical distance from the level surface on which an automobile is standing to the lowest point on the axle differential of the automobile.[98] We believe no change is needed to this definition regardless of whether the differential is sprung or unsprung, as the bottom of the differential is the vulnerable component. Other unsprung components of the suspension or axle will move with wheel travel and are therefore unlikely to be a factor in off-roading. NHTSA also asks whether the definition should be modified to account for axles without differentials. FCA believes there is no need to further modify the requirement. 2WD vehicles which have only one differential should have only one axle clearance measurement.

Additionally, NHTSA seeks comments on whether axle subframes which are mounted to the vehicle unibody should be considered in the allowable running clearance. FCA believes axle subframes should be required to meet the 20cm running clearance requirement.

Finally, the agency asks whether the running and axle clearance criteria should be replaced with a single criterion that considers all components underneath a vehicle. FCA does not believe a single criterion is needed, and we prefer to keep the existing rules. If the agency does not agree, then we would be interested in discussing the merits of a proposal that could harmonize requirements with other regional requirements before NHTSA takes action.

FCA Comments on Cost and Benefit (Modeling)

FCA supports the Alliance comments on modeling, especially with respect to the agencies using one modeling system.

Having two modeling systems for the same general purpose is wasteful and confusing. Not only are the simulation tools different, but each agency then makes different assumptions and uses different inputs. For example, in the Draft TAR, EPA used the 2014 model year for the baseline fleet while NHTSA used 2015. EPA also considered the California ZEV mandate while NHTSA's analysis was independent of that program. For determining costs, EPA used ICMs (indirect cost multipliers) while NHTSA used RPEs (retail price equivalent).

Not surprisingly, with different modeling tools, vehicles, sales volumes, costs, and ancillary programs, each agency reached different conclusions about the cost and technology required for compliance. For example, EPA found that the most cost effective solution for FCA's passenger car fleet would be advanced Atkinson style engines along with PHEVs and BEVs. NHTSA, on the other hand, determined that downsized turbocharged engines along with mild and strong hybrids would be the optimal solution.

The modeling performed by the agencies should illuminate the differences between the CAFE and GHG programs. This cannot be accomplished when each agency is using different tools and assumptions. Since we believe NHTSA possesses the better set of tools, we support both agencies using Autonomie for vehicle modeling and Volpe (CAFE) for fleet modeling.

[98] 49 C.F.R. § 523.2.

Improvement Opportunity #1 – Costs & Benefits are Optimistic

While FCA recommends that both agencies use the Autonomie/Volpe modeling system, and we recognize the improvements of the new Volpe model over the Draft TAR version, we continue to believe that the cost and benefits used as inputs to the model are overly optimistic.

FCA recently introduced new models of the Jeep Wrangler Unlimited and the Ram 1500 pickup. When compared to the old models, these vehicles provide real life examples of the costs and benefits that can be achieved with fuel and weight saving technology.

The new Wrangler has significant improvements, especially powertrain improvements, which greatly reduce fuel consumption. But after all of the real world concerns such as emissions, driveability, OBD, and fuels are considered, the benefits observed remain less than those derived by the Autonomie model and used as inputs to the Volpe model.

The Ram 1500 achieved several hundred pounds of weight reduction. But the cost of achieving that weight reduction was greater than that used in the Volpe model.

The following sections provide more detailed comments on these examples.

MY2018 Jeep Wrangler Unlimited Fuel Savings Example

The following table compares the MY2018 JK Wrangler (the older, carry-over model) to the new MY2018 JL Wrangler with an optional powertrain. This new powertrain features a downsized turbocharged engine, an upgraded 8-speed transmission, and a belt starter generator. These are technologies recommended by the agencies as mainstream solutions since the start of One National Program.

The vehicles are described according to the technology paths used in the Volpe model. The JK specifications are the same as the MY2016 Wrangler specifications used in the "market_inputs" file. The new JL model includes all of its new technologies. Using the FC1_Improvements file derived from Autonomie simulations, a fuel consumption improvement factor can be found for each model using the Tech Key shown in Figure 46. The overall technology benefit is then determined from the ratio of these improvements.

		JK (old model) Wrangler	**JL (new model) Wrangler**
Volpe Model Results	Class	MedSUVPerf	
	Engine	DOHC VVT (3.6L NA)	TURBO2 (2.0L, 25 bar engine)
	Transmission	AT5 (5 Speed)	AT8L2 (Improved 8 Speed)
	Electrification	CONV (None)	BISG (48V Belt Starter Generator)
	Mass	MR0 (Baseline)	MR0 (lower but same ETW)
	Aero	AERO0 (Baseline)	AERO5 (>5% reduction in CdA)
	Tires	ROLL10 (10% better than baseline)	ROLL20 (20% better than baseline)
	Tech Key	DOHC;VVT;;;;;AT5;CONV; ROLL10;MR0;AERO0	;;;;;TURBO2;AT8L2;BISG; ROLL20;MR0;AERO5
	Fuel Consumption Factor	0.9855152373	0.67150981
	Benefit	**1 - 0.6715/0.9855 = 32%**	
	Actual FE	22.75 mpg	31.38 mpg

Actual Results	Actual gal/mi	0.0440 gal/mi	0.0319 gal/mi
	Benefit	**1 - 0.0319/0.0440 = 28%**	

Figure 46: Wrangler Fuel Economy Comparison[99]

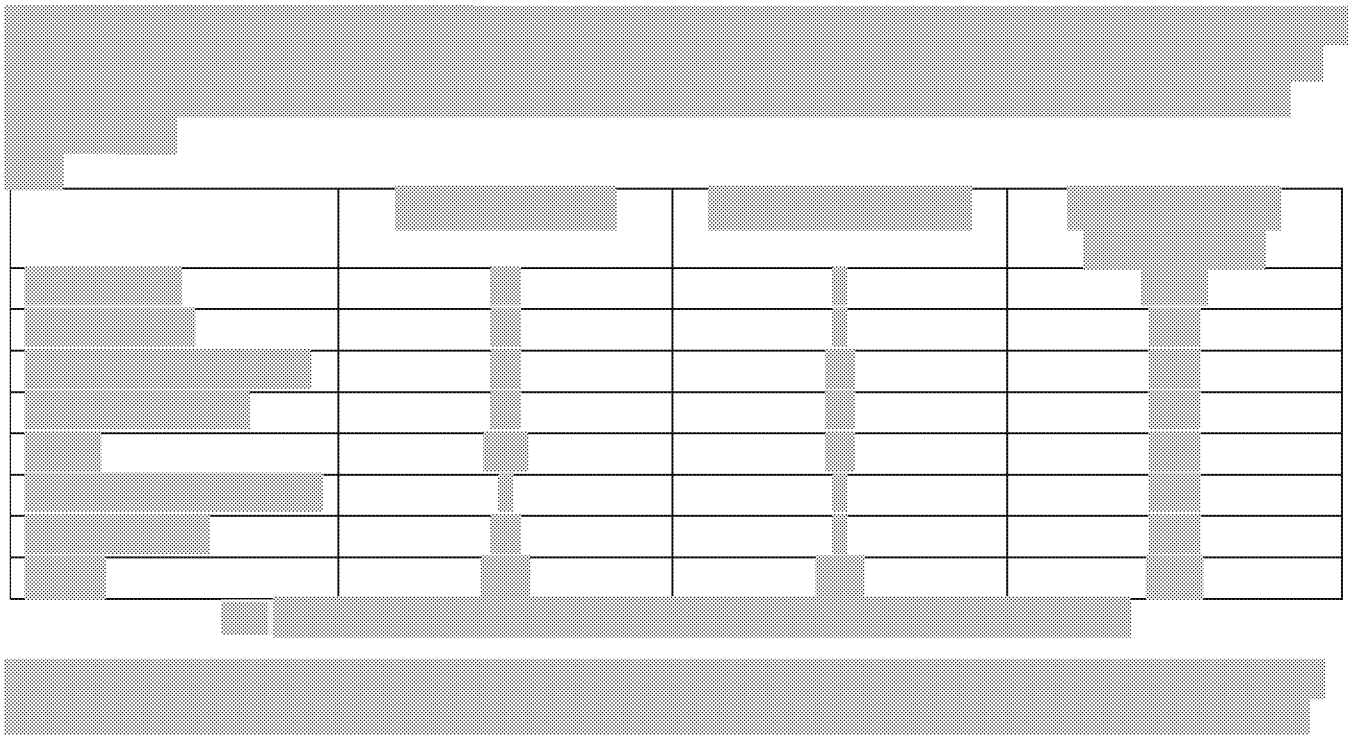
Also included in the table are the actual results for the new and old Wrangler models. The comparison shows that the modeled improvement is 32% while the actual benefit was 28%.

While this may appear to be a small error, but remember that the 5.5% difference in consumption (1–0.68/0.72 = 5.5%) is more than one year of compliance and would force higher levels of electrification.

While this is just one example and not a blanket criticism of the model, we want to reinforce how important these individual results are to the integrity of the entire process. FCA would be happy to meet with the Volpe Center and Argonne National Labs staff to discuss the differences in our results to improve the modeling process.

MY2019 Ram 1500 Mass Reduction Cost Example

The new model of Ram 1500 pickup includes many weight saving features. As required when launching a redesigned vehicle, FCA completed a thorough evaluation of how much weight could be saved and how much this weight reduction would cost. This exercise provides an up-to-date analysis of the real costs to reduce weight in a modern vehicle that already uses advanced steels and meets modern safety requirements.



[99] Fuel consumption factor from "FC1_Improvements.csv" found at "Argonne Simulation Results" in the Volpe model menu; actual fuel economy from 2018 Data File at www.fueleconomy.gov

[redacted]

[redacted]

[redacted]

Improvement Opportunity #2 – CAFE Model Electrification Cost Error

The 2018 NRPM version of the CAFE model contains a component cost error in the electrification path that, when corrected, increases the auto manufacturers estimated cost of compliance, as calculated in the CAFE model, by nearly $13 billion dollars if the augural standards were retained.

Technology Paths

There are a total of 19 technology paths available in the CAFE model to demonstrate possible fuel efficiency improvements available to industry. The CAFE model, within many constraints, attempts to identify the lowest cost path to compliance for industry.

One technology pathway is electrification, and is highlighted below in Figure 49.

[100] file: \Central Analysis\input\2018_NPRM_technologies_with_BEV_and_FCV_ref.xlsx

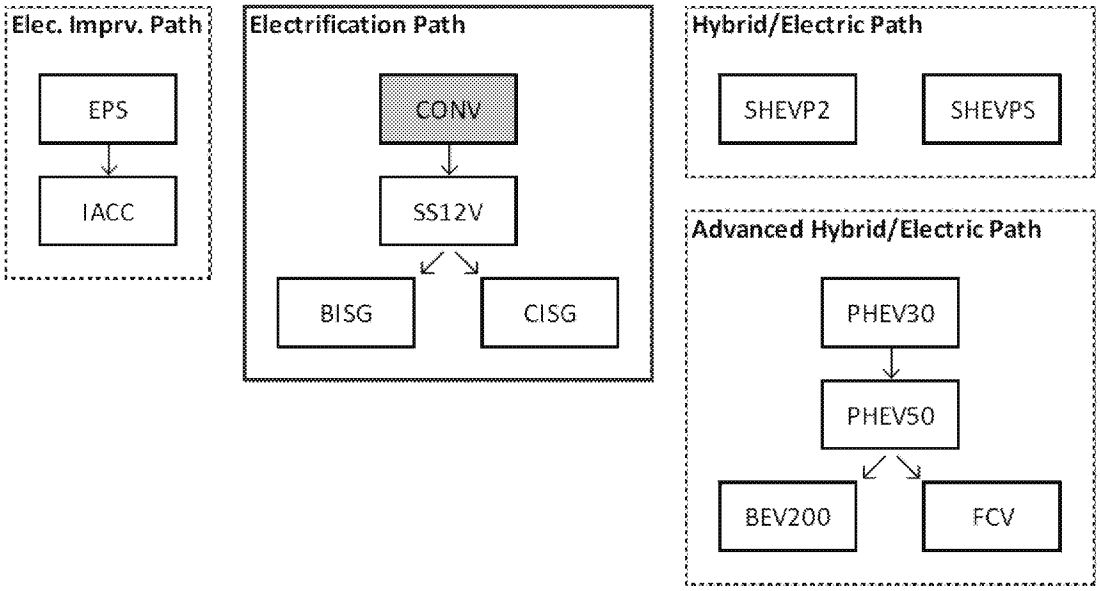


Figure 49: Vehicle Level Electrification Paths[101]

Implausible Electrification Path Costs

The electrification path incremental costs, not including the battery, are shown below in Figure 50. As can be seen there is a very distinctive and implausible change in costs for Belt and Crank Integrated Starter Generators (BISG/CISG) for all variants of Medium SUV and Pickup trucks, as compared to the cost of the same technology for Small Cars/SUVs and Medium Cars. In particular, the $225 drop in non-battery costs to go from 12V stop-start to BISG is misaligned with industry understanding.

Electrification	Small Car (inc Perf) Med Car (inc Perf) Small SUV (inc Perf) C-2015 Incremental Component Cost ($)		Med SUV (inc Perf) Pickup Pickup HT C-2015 Incremental Component Cost ($)
CONV	0.00		0.00
SS12V	727.91	≈	813.54
BISG	546.82	≠	-225.20
CISG	232.89	≠	1108.04

Figure 50: Electrification Costs[102]

An analysis of battery costs and cost learning revealed no other cost offset to this apparent error.

CAFE Modeling of Adjusted Electrification Costs

To explore what impact the component cost error had on the compliance cost, the CAFE model was rerun with technology input file costs modified. The Medium SUV and Pickup electrification costs were changed to be identical to the Small Car/SUV and Medium Car costs for SS12V, BISG, and CISG.

[101] Draft CAFE Model Documentation. 2018 NPRM for Model Years 2021-2026 Passenger Cars and Light Trucks, p.27
[102] CAFE Model Input File, 2018_NPRM_technologies_ref.xlsx

The results were analyzed for the augural (baseline/no action) standards and for Alternative 1 in order to explore the full range of program cost changes, and are summarized in Figure 51.

	Cumulative Tech Cost ($)	Cost/Vehicle ($)
2016-2026 Augural Standard	$12,976.0M	$67.84
2016-2026 Alternative 1	$12.1M	$0.06

Figure 51: Estimated Incremental Electrification Technology Costs

The cumulative incremental technology cost for the Augural Standards from 2016-2026 are nearly $13 billion dollars, or $68/car. For Alternative 1 from 2016-2026, the cumulative cost is miniscule at approximately $12 million dollars, or $0.06 per car.

The CAFE model must be updated to correct this so that the cost of compliance is properly reflected in the results.

Proposed Changes to Methane and Nitrous Oxide Regulations

Eliminate Methane and Nitrous Oxide Tracking in Existing Program

FCA appreciates the opportunity to provide feedback on the methane (CH_4) and nitrous oxide (N_2O) regulations. The agencies ask whether they should discontinue accounting for…

> "Methane emissions, and nitrous oxide emissions as part of the CO_2 emissions standards to provide for better harmony with the CAFE program….."[103]

FCA agrees with the agencies that this improves the harmony with the CAFE program and supports ONP. We support the Alliance position to eliminate the tracking of CH_4 and N_2O emissions, as was requested by the Alliance in its comments on regulatory burden relief in May of 2017[104].

In EPA's 2016 GHG Performance Report, CH_4/N_2O in excess of standards were only 0.045% of the total GHG emissions.[105] With gasoline engine performance being contained within the current standards, E85 (with declining sales) and diesel (with relatively low sales compared to gasoline), are the main contributors to the emissions exceedance of CH_4/N_2O, which is minimal.

In addition, the current after treatment systems have limited impact on CH_4 and N_2O, as CH_4 can pass through the catalyst easily, and N_2O is formed in the catalyst.

Further, the measurement of N_2O is burdensome as the technologies used to measure it are still evolving. The current measurement technology for N_2O requires an "offline" type of a stand-alone sampling system which requires moving the N_2O analyzers that cannot be integrated into existing benches to a chemistry lab where emission bags are read manually. This is a very time consuming, laborious process which slows test cell throughput.

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[103] 83 Fed. Reg. at 42193.

[104] Alliance of Automobile Manufacturers Comments to EPA on OAR on Regulatory Burden, Issue 1.30; Docket ID #EPA-HQ-OA-2017-0190, (May 15, 2017).

[105] Calculated from data in EPA 2016 GHG Performance Report tbls.B-1, 3-23, 3-27, 3-28.

Continued Agency Regulation of Methane and Nitrous Oxide

In the proposed rule,

> "EPA also seeks comment on whether to change existing methane and nitrous oxide standards that were finalized in the 2012 rule."[106]

If EPA does not discontinue the accounting of CH4/N2O, then FCA requests that the standards be reevaluated for appropriateness. As noted by the Alliance, in setting an N2O standard in the 2012-2016 GHG Final Rule, EPA relied on limited test data to set the standards. Other concerns have also been highlighted by the Alliance, including:

- The analyzers used to measure N_2O had cross interference of other constituents
- Some data points were not included when setting the N_2O cap
- The assumptions for fuel usage for FFVs had ethanol at 100% ethanol fueled operation rather than the more accurate 1% ethanol fueled operation

Should the regulation of CH4/N2O continue, FCA recommends that the compliance methodology be changed to a fleet average program, with averaging, banking and trading (AB&T) of CH4/N2O credits, allowing for accounting of both under and over compliance with the standards, similar to other mechanisms already in place in the GHG rule. Such a structure would provide the flexibility to offset lower performing applications (i.e., diesel, FFV, etc.) with higher performing applications without introducing a CO2 penalty. In addition, the measured value should be an average of both FTP and HWFET test cycles, in line with how CO2 is established.

In consideration of the minimal contribution of CH4/N2O emissions and the reporting burdens, FCA believes the agencies' goals can be achieved without regulation in this segment. If this is not possible, FCA supports leaving methane and nitrous oxide in the current GHG regulations, with consideration for the above mentioned adjustments to standards and supplemental flexibilities.

Separate Regulations for Methane and Nitrous Oxide

If CH_4 and N_2O are to be regulated independent of the GHG regulations, FCA would like to work with the agencies on any viable solution that addresses regulatory burden while providing a flexible solution.

[106] 83 Fed. Reg. 43198 NHTSA-2018-0067; EPA-HQ-OAR-2018-0283; FRL-9981-74-OAR (Aug. 24, 2018)

6. Preemption of State Law and Regulation

Prior to the establishment of ONP, the automotive industry initiated litigation to establish that federal law preempts state laws and regulations that govern motor vehicle GHG emissions.[107] The goal of the litigation was to avoid a patchwork of overlapping and inconsistent federal and state regulations. At that time, industry took the position that state laws and regulations are expressly and impliedly preempted by EPCA and such state laws and regulations are not entitled to receive waivers of preemption pursuant to Section 209 of the Clean Air Act. In parallel to the litigation, the automotive industry worked with stakeholders to establish a program that would avoid inconsistent and potentially conflicting sets of fuel economy and GHG standards. Those efforts led to the creation of ONP, which resulted in EPA and NHTSA attempting to harmonize their regulations and CARB agreeing not to enforce state-specific GHG standards against manufacturers complying with the federal standards.

The ONP satisfied the industry goals at that time – avoiding balkanized regulations of the nation's automotive fleet. Despite strong legal arguments, the industry dismissed its preemption cases on the eve of the appellate ruling only because it was necessary in order to allow the practical solution of ONP to move forward. Notably, the cases were dismissed before any appellate rulings on the merits. The Vermont case (*Green Mountain*) offered no rationale for its key conclusion that a Sect. 209 waiver silently converted a state regulation into a federal regulation – although that regulation was adopted by and would be enforced by a state. Despite the dismissals motivated by then-current practical considerations, FCA is confident that the arguments made by industry in those cases – and endorsed in the NPRM and a Justice Department *amicus* brief -- are compelling and would now prove successful if circumstances demanded that they be revived and litigated to completion.

Just as before, FCA prefers maintaining ONP, which would afford a practical solution and avoid a patchwork of potentially inconsistent and conflicting state and federal laws and regulations, even if such state laws and regulations are in place for a brief period of time while litigation proceeds through the courts. Nevertheless, FCA agrees with the Alliance that NHTSA may reasonably return to its original interpretation that its CAFE standards should preempt state GHG standards and the ZEV mandate.

EPCA contains an express preemption provision that NHTSA can reasonably interpret as preempting state tailpipe GHG standards. That provision provides that "a State or a political subdivision of a State may not adopt or enforce a law or regulation related to fuel economy standards or average fuel economy standards for automobiles covered by an average fuel economy standard under this chapter."[108] Fuel economy and tailpipe CO_2 are inexorably linked. The direct mathematical relationship between the two is undeniable. As the Alliance points out, NHTSA measures and calculates fuel economy for purposes of CAFE compliance through the use of the same tests, vehicles, sales data, and emissions measurements that the EPA uses to measure carbon dioxide and tailpipe GHG emissions. Therefore, there is a strong argument that EPCA preempts state standards governing tailpipe CO_2 emissions. Likewise, FCA agrees with the Alliance that NHTSA also could conclude that state GHG standards are impliedly preempted by EPCA because they undermine the fuel economy program established by Congress.

FCA agrees with the Alliance that NHTSA could reach a similar conclusion about state ZEV mandates. As NHTSA points out, the purpose of state ZEV programs is "to affect fuel economy."[109] Therefore, it is reasonable to conclude that ZEV mandates are "related to" fuel economy and, thus, expressly preempted by EPCA. As the

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[107] *See Green Mountain Chrysler v. Crombie*, 508 F.Supp.2d 295 (D. Vt. 2007); *Central Valley Chrysler-Jeep, Inc. v. Goldstene*, 529 F.Supp.2d 1151 (E.D. Cal. 2007), *as corrected* (Mar. 26, 2008).
[108] 42 U.S.C. § 32919(a).
[109] 83 Fed. Reg. at 43238.

Alliance explains ZEV mandates interfere with efforts to comply efficiently with CAFE standards. As such, ZEV mandates may reasonably be impliedly preempted by EPCA and its CAFE standards.

Finally, FCA agrees with the Alliance that EPA has a basis to conclude that its waiver of preemption for the California GHG standards and ZEV mandate should be withdrawn. FCA agrees with the EPA's conclusion that any effects of GHG emissions are felt globally and are not unique to California. In certain circumstances, local air problems appropriately justify state-specific standards. For example, FCA complies with standards to address local air quality issues by selling vehicles that meet California's stringent LEV III tailpipe emission standards to control smog. However, that is not the case here. Therefore, it would be reasonable for EPA to conclude that California does not face any extraordinary conditions that would set it apart from the rest of the country and warrant different GHG emissions standards.

As explained previously, FCA prefers ONP that incorporates standards that take into account the current compliance gap and the realities of the marketplace. In the absence of such a program, litigation may be necessary to avoid a patchwork of overlapping and inconsistent state and federal laws and regulations. While preemption litigation may cause short-term uncertainty, inappropriate standards could disrupt the automotive marketplace for years to come.

Appendix 2: AC and Off-Cycle Table Additions

Air Conditioning Direct Credit Due to Leakage

EPA can simplify and improve the credit calculation for MAC systems that use low GWP refrigerants such as R1234yf. EPA added a "high leak disincentive" to the credit calculation in the 2017 Final Rule that should be removed.

The high leak disincentive is a penalty on MAC systems that applies only to low GWP refrigerants. The high leak disincentive is calculated based on the SAE J2727 leakage rate and a leak threshold term defined as 1.5% of the total system charge. When the SAE J2727 leakage rate is less than the leak threshold the high leak disincentive is set to zero. If the SAE J2727 leakage rate is higher than the leak threshold, the high leak disincentive becomes a positive number which will reduce the credit value of the system. Consider the following examples showing the disincentive to be arbitrary and unnecessary.

A MAC system has an SAE J2727 leak rate of 11 grams per year and a 750-gram refrigerant charge. If using R134a as the refrigerant, the MAC system earns a credit of 4.3 g/mi for a passenger car and 7.3 g/mi as a light duty truck. If using R1234yf, a low GWP refrigerant, the MAC system earns a higher credit of 13.8 g/mi for a passenger car and 17.2 g/mi as a light duty truck. The high leak disincentive for this case would calculate to zero since the SAE J2727 system leakage of 11 grams/year is less than the leak threshold of 11.25 grams/year (1.5% of 750 grams=11.25 grams/year). The credit is not reduced. Figure 52 summarizes the result.

LeakScore	GWP	Car Credit	Truck Credit	Car Disincentive	Truck Disincentive
11	4	13.8	17.2	0	0
11	1430	4.3	7.3	0	0

Figure 52: System leakage related to refrigerant type and effect on high leak disincentive.

Now consider that same system with a leak score of 12 grams per year. The leak threshold is triggered because 12 grams per year is higher than 11.25 grams /year. The credit for this MAC system is reduced for the low GWP refrigerant by 0.4 g/mi to 13.4 g/mi for a passenger car and by 0.5 g/mi to 16.7 g/mi for a light duty truck. This same system using R134a as the refrigerant would be credited at 3.5 g/mi for a passenger car and 6.6 g/mi for a truck. Figure 53 summarizes the result.

LeakScore	GWP	Car Credit	Truck Credit	Car Disincentive	Truck Disincentive
12	4	13.4	16.7	-0.4	-0.5
12	1430	3.5	6.6	0	0

Figure 53: System leakage related to refrigerant type and a positive high leak disincentive.

The credit program was set up to reward and incentivize leakage improvements to keep GHG emissions related to refrigerant from the atmosphere. A low GWP refrigerant puts less equivalent CO_2 in the atmosphere than a high GWP refrigerant. The GWP of R134a is 1430. The GWP of CO_2 is defined as 1. Each gram of R134a that enters the atmosphere is equivalent to 1430 grams of CO_2 entering the atmosphere as related by their GWP.

The GWP of R1234yf is 4. Each gram of R1234yf released into the atmosphere is the equivalent of 4 grams of CO_2. Each gram of R134a released into the atmosphere is 353 times more potent that the equivalent release of R1234yf as related by their GWPs (1430/4=353). The high leak disincentive should be treated the same way.

The high leak disincentive applied to the MAC system in the example should be reduced by 353 times in accordance with GWP. The high leak disincentive in the case of a passenger car then becomes zero as does the case for a light duty truck. The above leaks an additional gram of refrigerant the amount of credit reduction should be in proportion to GWP. The reduction of 0.4 g/mi then becomes zero for both passenger cars and light duty trucks.

The effect is that the GWP ratios of refrigerants neutralizes the high leak disincentive. If EPA considers keeping the high leak disincentive it should be applied only to high GWP refrigerants, not low GWP refrigerants.

The second argument to make for removal of the high leak disincentive is that the low GWP refrigerants are expensive relative to R134a. OEMs are incentivized to keep the expensive refrigerant from entering the atmosphere due to warranty costs. High SAE J2727 leak rates correlate directly with performance loss. Customers experiencing performance loss will have their systems recharged more frequently and this will be a larger warranty expense. OEMs do not want angry customers or to incur the warranty expense of leaky AC systems with expensive refrigerants. The disincentive in this second case is market based and more efficient than the disincentive given in the rule.

Combined Air Conditioning Efficiency and Thermal Control Menu Technology Updates/Additions

Based on the new baseline of 23.5 grams CO_2 per mile for air conditioner energy usage, and incorporating the new technologies described above, the rescaled pre-approved list of MAC indirect credits would be as shown in Figure 54 beginning in the 2021 model year. Because the NREL analysis cited above showed lower effectiveness for the active and passive cabin ventilation technologies, the credits for these two technologies are not increased in this proposed new pre-approved credit table. The credit for internal heat exchangers ("IHX") has also not been increased based on the most recent evaluations of this technology.

	Current Values		NREL Supported Future Values	
	Car	Truck	Car	Truck
Reduced Reheat (EVDC)	1.5	2.2	2.5	3.6
Reduced Reheat (fixed)	1.0	1.4	1.6	2.3
Scroll Compressor	NA	NA	2.5	3.6
Default to Recirc (closed loop)	1.5	2.2	2.5	3.6
Default to Recirc (open loop)	1.0	1.4	1.6	2.3
Internal Heat Exchanger	1.0	1.4	1.0	1.4
Improved Evaporators/Condensers	1.0	1.4	1.6	2.3
Oil Separator	0.5	0.7	0.8	1.1
High Efficiency Blower Control	0.8	1.1	NA	NA
Denso SAS Compressor	NA	NA	1.7	1.7
Glass	up to 2.9	up to 3.9	up to 4.8	up to 6.4
Paint	0.4	0.5	0.7	0.8
Active Seat Ventilation	1.0	1.3	1.6	2.1
Active Climate Control Seat	NA	NA	3.5	4.5

Passive Cabin Ventilation	1.7	2.3	1.7	2.3
Active Cabin Ventilation	2.1	2.8	2.1	2.8

Figure 54: Updated list of AC Efficiency and Solar Thermal Technologies updated to show NREL credit values and technology additions.

Note that the updated MAC indirect credit list includes new credits for scroll compressors and compressors with variable CS valves (both under the cap), but removes the credit for high efficiency blower controls from the MAC/thermal cap, and moves this credit to the off-cycle credit list. These changes roughly offset each other with respect to the coverage of the combined MAC indirect/thermal control technology cap.

A number of technologies have been evaluated by FCA and suppliers. We propose the following technologies be added to the pre-approved table when the new rule is issues.

Mitsubishi Heavy Industries Thermal Systems Scroll Compressor

The heart of a MAC system is the compressor. There are many different types of compressors and they all operate to increase the pressure of the refrigerant and move it through the MAC system. Compressor differences amount to the way compression occurs with the most prevalent in MAC systems being the piston type.

Piston type compressors employ reciprocating pistons running in cylinders where valves at the end of the cylinder manage refrigerant intake (suction) and exhaust (discharge). They are fairly simple machines that compress a fixed amount of gaseous refrigerant with each rotation of the compressor shaft. Each rotation of the compressor shaft causes the piston to reduce the amount of volume in the cylinder which raises the pressure until the discharge valve opens and the refrigerant is exhausted from the cylinder. A piston having a constant volume to compress in each revolution is considered a fixed displacement compressor.

Another type of fixed displacement compressor is this scroll type that achieves compression in much the same way. Two scrolls are arranged such that the scroll volutes are nested together creating a fixed volume between them. One scroll is fixed to the compressor body and remains stationary. The other scroll is attached to the compressor shaft and allowed to move relative to the fixed scroll. The motion between the scrolls causes the volutes to decrease the volume between the scrolls and increase the pressure until the discharge valve is opened and refrigerant is exhausted from the scroll chamber.

Piston type compressors can have from five to seven pistons in each compressor. These compressors work well in sizes from 160 to 220 cc where the size depends on how much conditioned space is in the vehicle.

Scroll compressors have the one scroll chamber and typically compress a smaller volume of refrigerant per compressor shaft rotation. A typical scroll size is between 70 and 90 cc. Scroll compressors are very good at conditioning smaller cabin volumes and indeed replace piston style compressors due to their higher efficiency.

Scroll and piston type compressors have been evaluated in Academia with several papers published. See Grace, I.; Datta, D.; and Tassou, S. A., " Comparison Of Hermetic Scroll And Reciprocating Compressors Operating Under Varying Refrigerant Charge And Load " (2002), International Compressor Engineering Conference Paper 1518, http://docs.lib.purdue.edu/icec/1518.

FCA recently evaluated the Mitsubishi QSH90 scroll compressor to quantify the scroll compressor's benefits relative to a small displacement electronically-controlled variable displacement compressor ("EVDC") both on a

test bench stand and in a vehicle application. The bench tests were run according to the requirements of SAE J2765 and those results were then run through the Life Cycle Climate Performance model to determine the CO_2 benefit. The test results along with data on the competitive compressor are given in Appendix 3.

The vehicle testing confirmed that the bench test results carried over to the vehicle in FCA standardized testing. The extensive testing shows that the QSH90 scroll compressor performs as well as or even better than an equivalent small displacement EVDC compressor.

The QSH90 compressor qualifies for the base credit level allowed for fixed displacement compressors under the Indirect AC Menu as part of the reduced reheat technology, 1.0 g/mi for a car and 1.4 g/mi for a truck. The EVDC compressor qualifies for a higher level of credit under the Indirect AC Menu as part of the reduced reheat technology, 1.5 g/mi for a car and 2.2 g/mi for a truck.

The EVDC compressor emissions are higher than for the scroll compressor as shown by bench and vehicle testing shown below. Additionally, this information was verified by an outside independent research facility with similar results.

The benefit of the QSH90 scroll technology exceeds the value of a comparable EVDC compressor. FCA asks that the Mitsubishi QSH90 Scroll Compressor be added to the Indirect AC Menu and be credited for reheat purposes the same as an EVDC at 1.5 g/mi for a car and 2.2 g/mi for a truck. In addition to the reduced reheat credit we ask that the compressor also be added as a line item technology similar to the Denso SAS compressor at a discounted credit amount of 1.1 g/mi for both cars and trucks based on the data presented in the figures provided by Mitsubishi Heavy Industries Thermal Systems Ltd. in Appendix 3.

Denso SAS Compressor Credit Evaluation

The Denso SAS Compressor has been evaluated by EPA as worth 1.1 g/mi CO_2 for many OEMs based on the LCCP analysis that showed the compressor benefit.

The LCCP model has been updated to account for many changes since it was developed. Additional cities have been added to the analysis both in North America and in the rest of the world to make it a global tool. The additional North American locations give a fuller picture of the benefit of the technology since the data adds additional discrete points and approaches vehicle emissions due to MAC systems in a more continuous nature. A good tool has been made better.

The LCCP model has been updated to take into account the changes to the climate, mostly temperature increases. The temperature increases lead to changes in duty cycle for the MAC system and the emissions due to MAC system usage have increased as expected.

The new LCCP model update now reports much more accurately the mobile MAC emissions. The LCCP results echo the NREL results presented at TMSS in October 2017 that MAC system emissions are too low in the current rule and need to be adjusted for real world use. See "U.S. Light-Duty Vehicle Air Conditioning Fuel Use and the Impact of Four Solar/Thermal Control Technologies", C. Kreutzer, B. Kekelia, J. Rugh, G. Titov, October 10-12, 2017 SAE Thermal Management Systems Symposium, p. 40. Consequently, MAC emissions reductions are undervalued as well.

The value of the Denso SAS compressor is undervalued at 1.1 g/mi CO_2 when looking at the NREL and new LCCP results. The LCCP model credits the Denso SAS compressor at 1.9 g/mi. Applying the NREL data the value the

value of the Denso SAS compressor is an emissions reduction of 1.8 g/mi. FCA requests that the value of the Denso SAS compressor be adjusted from 1.1 g/mi CO_2 to 1.8 g/mi CO_2 beginning with the new rule.

Air Conditioning - Indirect Credit (Efficiency)

Introduction/Background

EPA created a list of efficiency technologies that earn a pre-defined and pre-approved credit in grams per mile CO_2 in the 2012-2016 light-duty GHG and CAFE regulation. The efficiency technologies were termed "indirect" mobile air conditioner (MAC) credits where the vehicle emissions improvements were an indirect consequence of reduced fuel consumption in the more efficient MAC system. The baseline for these credits was EPA's estimate of the total fuel usage from light-duty mobile air conditioner usage in the United States, which EPA estimated to be 14.3 grams CO_2 per mile, or 3.9% of total national light-duty vehicle fuel usage.

The technologies identified for pre-approved credits and the percentage efficiency improvement estimates for these technologies came primarily from the Improved Mobile Air Conditioner (IMAC) industry-government Cooperative Research Program conducted through SAE International. IMAC was a partnership between EPA, DOE and 28 corporate sponsors, which published its final report in 2007. The IMAC program demonstrated an improvement of 36.4% in MAC efficiency using best-of-the best designs for these technologies on a test vehicle, compared to a baseline MAC system using a defined list of typical technologies in production at that time, such as a fixed displacement compressor.

EPA estimated from the IMAC work that a 40% reduction in emissions was possible when employing the indirect AC menu technologies in the study. That reduction equates to a 5.7 g/mi CO_2 reduction (0.40 X 14.3 g/mi CO_2) which then became the capped credit value for employing the technologies on the indirect AC menu from the "Final Rule for Model Year 2012-2016 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards." The cap was modified for the 2017 final rule to better align the efficiency improvement credit values based on the physics of cars and trucks. The 2017 menu cap for passenger cars was modified to 5.0 g/mi CO_2 and 7.2 g/mi CO_2 for trucks.

The pre-defined and pre-approved MAC indirect credit menu has proven to be highly successful. Air conditioning efficiency technologies were not heavily deployed in U. S. sold vehicles when the 2012 final rule came into effect. The industry could claim an average of 1 g/mi CO_2 in indirect AC credits in 2009 or roughly 20% of the available menu cap at that time. Since then the MAC efficiency technologies have been widely deployed in the U. S. vehicle fleet, averaging nearly 4 g/mi CO_2 of indirect AC credits in 2016 or about 70% of the maximum menu credit cap.

The current rulemaking is an opportunity to build on the success of the MAC credit program. The MAC efficiency community has steadily advanced the reduction of MAC emissions since the time of the first rule. New work performed by NREL shows that the U.S. average CO_2 emissions associated with MAC operation are much higher than those assumed by EPA when the credit values of the indirect MAC technology menu were derived.[110] Therefore, the benefits of those technologies are undervalued at their current values and should be updated.

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[110] *See* Kreutzer et al. (National Renewable Energy Laboratory), "U.S. Light-Duty Vehicle Air Conditioning Fuel Use and the Impact of Four Solar/Thermal Control Technologies," presentation at SAE 2017 Thermal Management Systems Symposium, October 2017. Comparing NREL 2016 assessment of 23.5 g CO_2/mile (p. 40) to EPA derivation based on 14.3 g CO_2/mile (U.S. Environmental Protection Agency, "Final Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards Regulatory Impact Analysis," EPA-420-R-10-009, April 2010 at 2-30.)

The NPRM requests feedback on the government's proposal to merge the Solar Thermal Menu technologies with the Indirect AC Menu technologies. FCA approves of removing the Solar Thermal Menu technologies from the Off-Cycle Menu and adding them to the Indirect AC Menu. FCA approves raising the cap as the sum of the two menu values as determined by the NREL study.

Rapid technology deployment following the menu introduction and the Denso SAS compressor have spawned new innovations in the MAC efficiency field. Other compressor manufacturers have developed competing technologies to the Denso SAS compressor that can be quickly credited and deployed.

Other leaders in this field have innovated based on the idea that further reductions in fuel use due to MAC system operation are possible. System innovations such as the Ejector Evaporator Cycle and Zone Control further reduce MAC emissions on top of the technologies employed in the Indirect AC Menu.

The LCCP model originally pioneered by EPA and industry continues to improve with updated climate data for many more cities in the world. SAE specifications have been developed to test the validity of MAC emissions reduction technologies. The agencies and Industry remain committed in partnership to developing, implementing and improving the tools needed to continue the beneficial impact in MAC system efficiency for the future when the next generation of technologies will deliver passenger comfort in novel ways.

MAC indirect credits continue to play a critical role in industry compliance with the light-duty vehicle greenhouse gas regulation and achieving emission reductions that would not otherwise have been possible using the previous CAFE regulatory framework.

The current rulemaking should be used as an opportunity to build on the success touted above and achieve additional real world emissions reductions. This can be done by adding new technologies we discuss below to the combined menu with pre-approved credit values and revising the credit caps based on the NREL work. In the following passages, we propose a reorganization and rationalization of the air conditioner and off-cycle credits to reflect all the new information and understanding that has been gathered in the many years since the creation of these regulatory provisions. The recommended reforms would:

- Raise the cap on air conditioning efficiency and thermal control technology caps by 64% and combine them under a single cap,
- Increase certain existing air conditioner efficiency and thermal control technology credits by up to 64%,
- Create new regulatory provisions to handle further new air conditioner and thermal technology developments, and
- Transfer certain air conditioner credits for electrical technologies into the off-cycle credit list.

Eliminate AC17 testing requirements for claiming MAC system efficiency credits beginning with MY2021.

MAC System Efficiency Program Retention

As the agency analysis shows, the industry is able to achieve its environmental and energy goals more cost effectively if it can use flexibility mechanisms such as air conditioner efficiency credits to assist compliance. Therefore, although we recommend many improvements to these regulatory provisions, we request in general that these credit mechanisms be retained in the 2021-2026 regulations.

On Table Off-Cycle Technology Recommendations

High-Efficiency Alternators

EPA approved an off-cycle credit request by General Motors for high efficiency alternator/generators. The General Motors request established a credit for any alternator with an efficiency rating above 67%, based on the VDA test procedure for alternators that is the accepted industry standard. The credit is scalable, according to a formula that gives 0.16 grams CO_2 per mile for each 1% VDA efficiency improvement over 67%. To streamline administration of this credit, it should be added to the pre-approved on table list, such that all manufacturers can claim credits based on this formula.[111]

Efficient Electrical Device Credit

The basis for both the high-efficiency exterior lights and waste heat recovery credit is 3.2 g/mi CO_2 per 100W. The high-efficiency exterior lights credit is reduced to 1.0 g/mi CO_2 per 100W based on usage profiles of the various exterior lights not being used during 100% of VMT. The waste heat recovery credit is likewise reduced to 0.7 g/mi CO_2 per 100W due to assumptions that this is a continuously operating technology, with much of the benefit already being realized on-cycle. Therefore, there is existing, sufficient support from both agencies that the real-world benefit of reducing electrical demand on the vehicle is worth 0.032 g CO_2/mi perW. Any device, strategy, or operational characteristic that is able to reduce electrical demand over the baseline vehicle or incumbent technology should also be eligible for this benefit.

The value for each application should be bounded on the upper end by a 0.032 g CO_2/mi per W maximum for technologies that are enabled during 100% of real-world VMT but are disabled or otherwise not used during on-cycle testing. For the lower end, the value should be bounded by a minimum of 0.007 g CO_2/mi perW for technologies that are continuously operated during on-cycle testing. Technologies that fall between these two extremes in usage profile should be eligible for a variable credit between 0.007 and 0.032 g CO_2/mi perW based on an analysis of the amount of electrical load reduction achieved in real world driving exceeding that of on-cycle driving.

This creates a simple, linear calculation for the off-cycle credit depicted in the Figure below (for 100% VMT usage), in which the credit is calculated as follows:

$$Credit_{EED} = (0.032 - OnCycle_{EED}) * VMT\%$$

Where $Credit_{EED}$ is the off-cycle value in g/mi CO_2 per W for the efficient electrical device credit; $OnCycle_{EED}$ is the on-cycle benefit in g/mi CO_2 per W realized for the efficient electrical device; and VMT% is the percentage of VMT in which the technology is active.

[111] https://www.epa.gov/sites/production/files/2018-02/documents/gm-request-2010-2016-ghg-credit-active-high-effic-alt-fe6358-2017-10-06.pdf

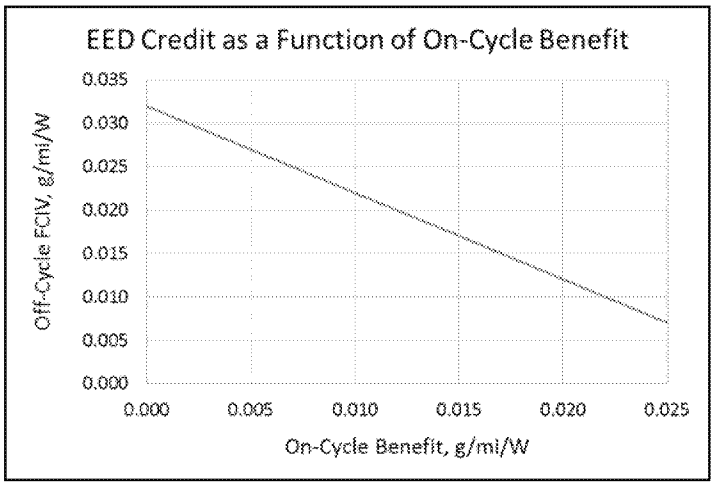

Figure 55: EED Credit as a function of on-cycle benefit

This methodology naturally limits the value of credit for technology used only intermittently through the use of the VMT% multiplier, while granting a proportional credit in line with values supported by NHTSA and EPA. The absolute maximum value of this credit will also be self-limited with size total vehicle electrical demand.

Rear Axle Active Warm-Up

Viscosity of rear differential axle oil is much higher in colder weather. Further, the viscosity of rear axle oil is much higher than that of engine and transmission oil. If heating is not provided to the rear axle, in real-world conditions the overall powertrain efficiency is degraded. Referring to Ricardo transmission and engine analysis in the Technical Support Document, heated axle technology for rear-drive passenger cars and trucks was not taken into account.[112] The Technical Support Document states for active transmission heating, EPA assumed that "this technology only affects the transmission (and differential on a front wheel-drive vehicle)"[113] but did not take into account rear drive differentials, which are separate from the transmission.

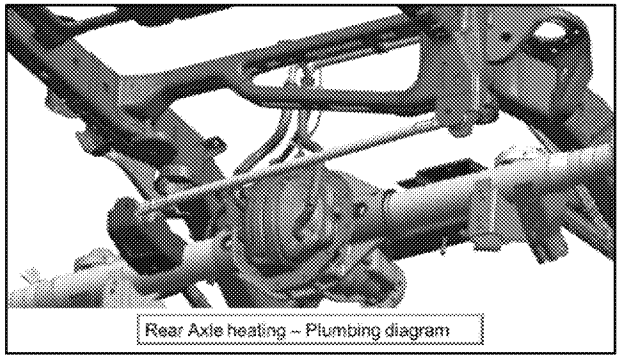

Figure 56: Production example: Dodge RAM 1500 heated axle

Actively warmed rear axles, with a dedicated heat exchange loop, should receive off-cycle credits. Incentivizing warmed rear axles will allow manufacturers to quickly deploy this technology because they will have regulatory certainty. Following the guidelines for how the engine and transmission warm-up credits were defined, rear axle active warm-up should obtain 1.5 g/mi CO_2 for passenger cars and 3.2 g/mi CO_2 for light-duty trucks.

[112] Technical Support Document at 5-97.
[113] *Id.*

Engine Encapsulation and Powertrain Bay Heat Retention

The European Union allows manufacturers to obtain off-cycle credits for powertrain bay heat retention and engine encapsulation. Automotive suppliers have invested research and development resources into this technology. Below is a graph that reveals the benefits that were determined in the European Union.

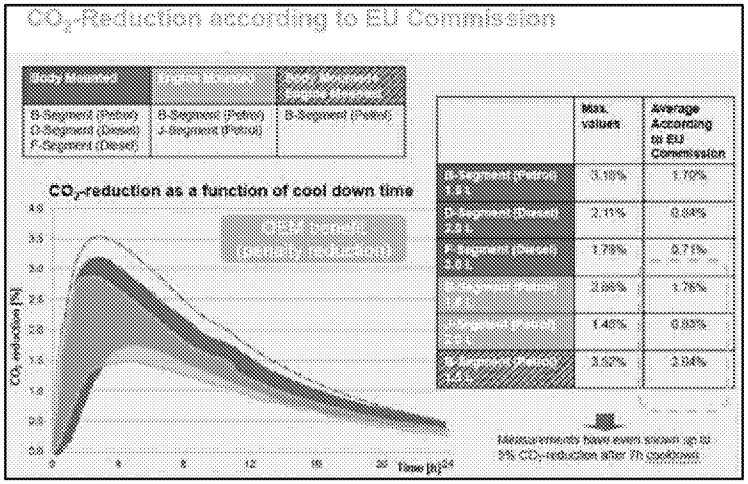

Figure 57: Body and Engine mounted encapsulation CO_2 improvement in Europe[114]

The EU devised a very thorough evaluation methodology for this technology; however, they included test procedures that are overly complicated. Therefore, FCA is recommending a simplified and streamlined off-cycle credit based on the EU method. For example, if a vehicle has powertrain bay hardware such as a hood blanket, engine hood cover, front and rear hood seals, hinge seals, wheel well covers and a belly pan, this design would be eligible for 1.5 g/mi CO_2. Likewise, if the engine and transmission are encapsulated, this design would be eligible for 3 g/mi CO_2. Powertrain bay heat retention and encapsulation technology is appropriate to encourage manufacturers to maintain heat soak temperatures fewer than 12 hours to reduce cold operation friction which ultimately improves real world fuel consumption.

Off-Cycle Thermal Reference information

Heating cold components to normal operating conditions quickly and keeping powertrain systems warm during shutdown improves fuel economy. To date, active engine warm-up and transmission warm-up technologies have proven to be effective off-cycle fuel consumption reductions, but additional powertrain system technologies need to be considered. The data presented below overwhelmingly provides evidence that off-cycle warm-up technologies contribute to improve real world cold weather operation.

EPA's Motor Vehicle Emission Simulator (MOVES) vehicle miles traveled (VMT) temperature data has observed that the U.S. vehicle fleet spends 83% of its time below 70° Fahrenheit and 10% of the time above 75° Fahrenheit[115]; therefore, it is appropriate that credits be granted for off-cycle technologies that are effective at reducing fuel consumption while operating under these ambient conditions.

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[114] Source Autoneum – Auto Supplier

[115] U.S. Environmental Protection Agency & National Highway Transportation Safety Administration, EPA-420-R-12-901, Joint Technical Support Document: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards

Table 5-28 MOVES data of vehicle miles traveled (VMT) as a function of ambient temperature.

VMT	tempAvg	Fraction	Temp Range VMT Fraction
1181656796	-25	0.00000157	
4490.70767	-20	0.00000595	
12905.217	-15	0.00001714	
40874.20742	-10	0.00005429	
174939.1854	-5	0.00023236	
762497.0884	0	0.00101274	
1915732.576	5	0.00254448	
4624729.91	10	0.00614097	
12435240.83	15	0.01651073	0.2196/8699
23259878.93	20	0.03089063	(< 40 deg F)
31418211.75	25	0.04172854	
41033016.47	30	0.05449962	
49426375.28	35	0.06564760	
54484761.76	40	0.07235805	
60396251.48	45	0.08021767	
63018086.25	50	0.08369804	
68380740.42	55	0.09082256	
73176481.47	60	0.09719224	0.68343503
72473451.14	65	0.09625848	(> 40 deg F, < 80 deg F)
67073884.17	70	0.08908897	
54637579.9	75	0.07255906	
38362130.05	80	0.05093566	
24162451.73	85	0.03211686	
7635253.418	90	0.01014106	
1203687.536	95	0.00159873	0.09607869
563360.566	100	0.00074810	(>80 deg F)
18352.30691	105	0.00002438	
752904971.9	TotalVMT	1.00000000	

Figure 58: MOVES USA ambient temperatures versus Vehicle Miles Traveled

Additionally, NREL and Argonne National Laboratory have explored the effects of powertrain efficiency due to viscous losses, warm-up effects, and soak time during a wide range of ambient conditions. NREL and Argonne have graphed the negative logarithmic friction impact effects for oil viscosity versus colder temperatures.

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and Corporate Average Fuel Economy Standards 5-87 (Aug. 2012), *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi/P100F1E5.PDF?Dockey=P100F1E5.PDF.

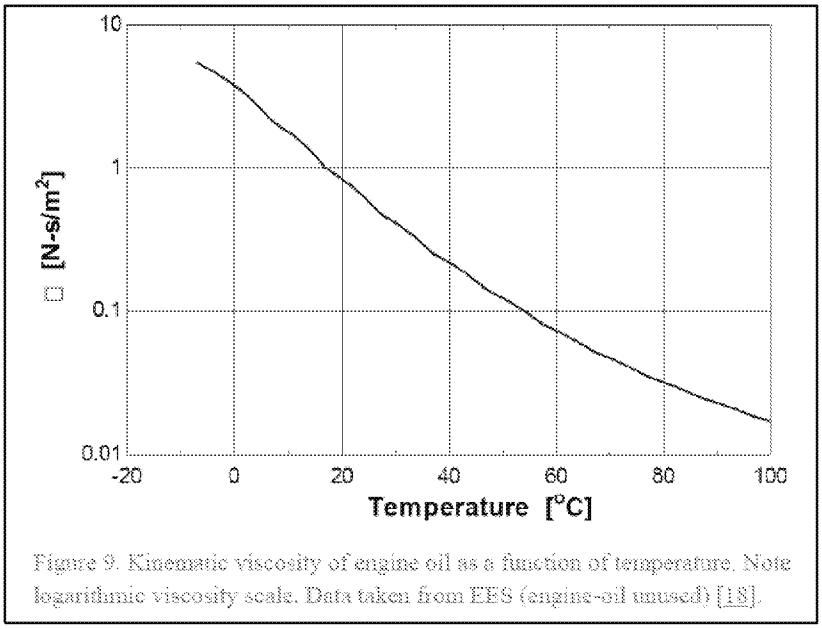


Figure 9. Kinematic viscosity of engine oil as a function of temperature. Note logarithmic viscosity scale. Data taken from EES (engine-oil unused) [18].

Figure 59: Oil viscosity versus temperature (logarithmic viscosity scale)[116]

Argonne has documented that powertrain efficiency decreases due to lower ambient conditions. Most notably, the energy fed into the powertrain is converted into 33% waste heat. Waste heat can be used to warm powertrain components.

[116] Eric Wood et al., *Simulated Real-World Energy Impacts of a Thermally Sensitive Powertrain Considering Viscous Losses and Enrichment* 5 (National Renewable Energy Laboratory, Conference Paper No. NREL/CP-5400-63255, Feb. 2015), *available at* https://www.nrel.gov/docs/fy15osti/63255.pdf.

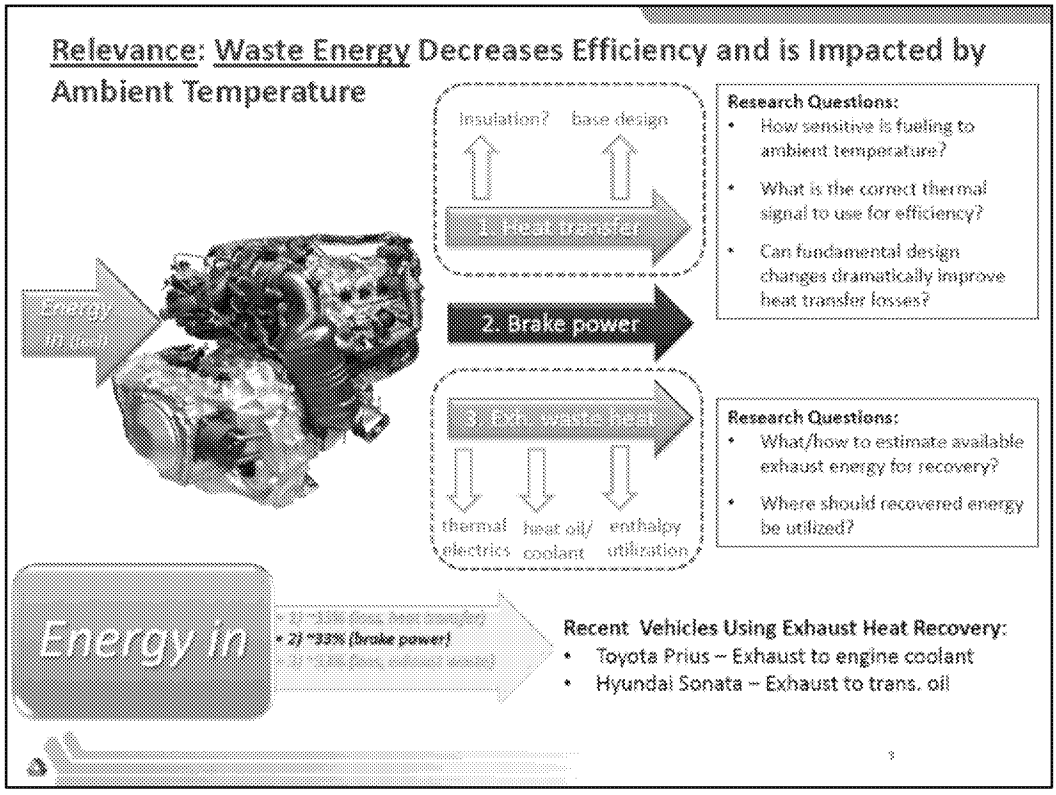


Figure 60: Thirty-three percent (33%) of the fuel energy fed into the powertrain is transformed into exhaust heat[117]

Argonne illustrates that seasonal temperatures define real-world economy. A Toyota Prius and Ford Fusion show degradation: more fuel consumed during cold ambient temperatures and during warm-up.

[117] Forrest Jehlik & Eric Rask, *2012FY Data Collection for Improved Cold Temperature Thermal Modeling: 2012 DOE Hydrogen Program and Vehicle Technologies Annual Merit Review* 3 (Argonne National Laboratory, Project ID #VSS080, May 14, 2012), *available at* https://www.energy.gov/sites/prod/files/2014/03/f9/vss088_jehlik_2012_p.pdf.

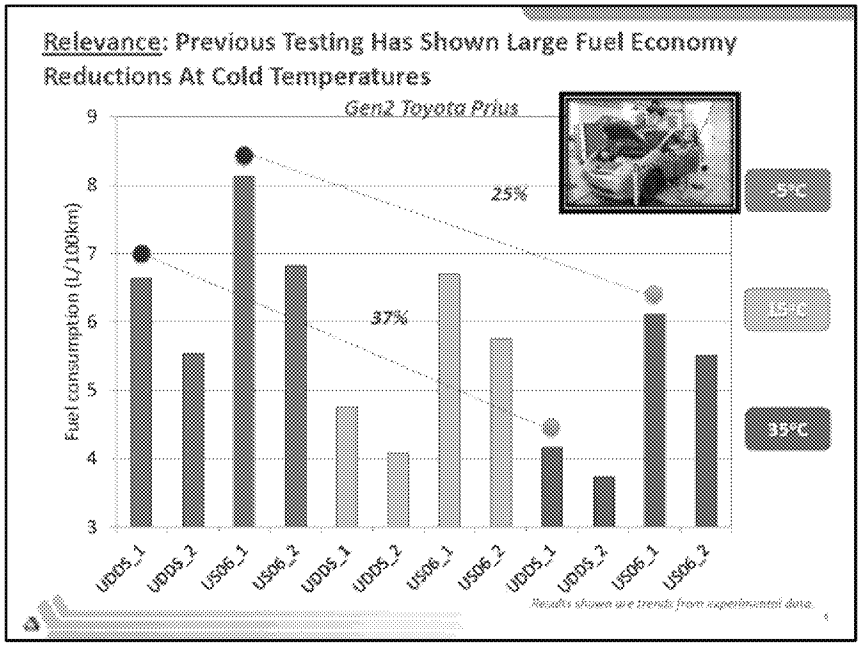


Figure 61: Fuel economy improves 25 to 37% when vehicle reaches operating temperature[118]

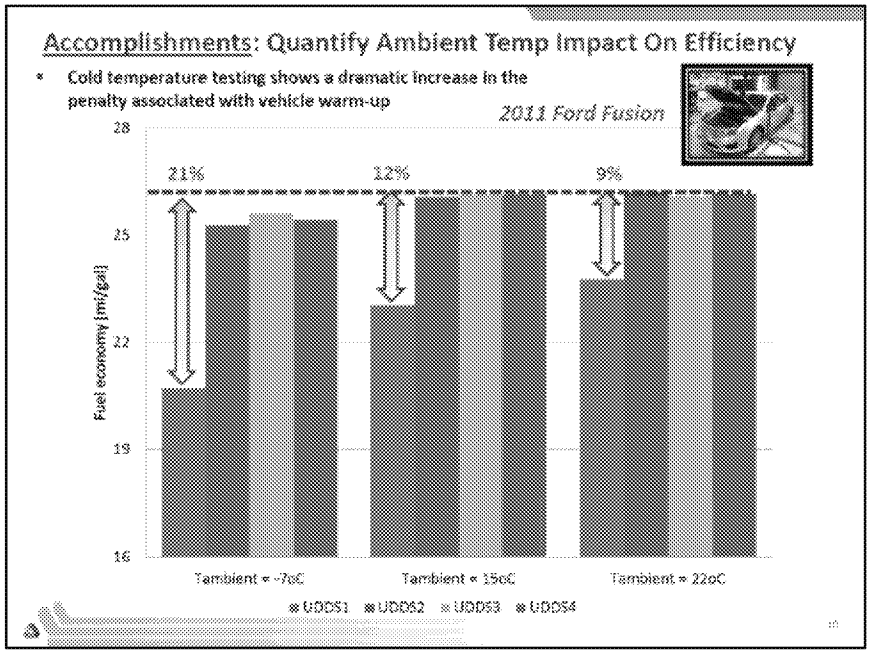


Figure 62: Fuel economy improves 9 to 21% when vehicle reaches operating temperature[119]

Exhaust Heat Recirculation System (EHRS) Active Warm-Up

To further increase overall powertrain efficiency, a vehicle equipped with a post-catalyst heat-exchanging device attached to the exhaust gas stream allows improved fuel economy and GHG emissions because the coolant warms much faster to further enhance engine, transmission, and axle efficiency. By measuring the fuel consumption reduction associated with accelerating warm-up from an exhaust heat recirculation system (EHRS),

[118] *Id.* at 4.
[119] *Id.* at 10.

one can determine the amount by which vehicle efficiency is improved. Supporting data for the EHRS was presented by Faurecia at the U.S. Department of Energy's 2011 Directions in Engine Efficiency and Emissions Research Conference; Faurecia stated that "about 1/3 of the energy stored in the fuel is lost through the exhaust."[120]

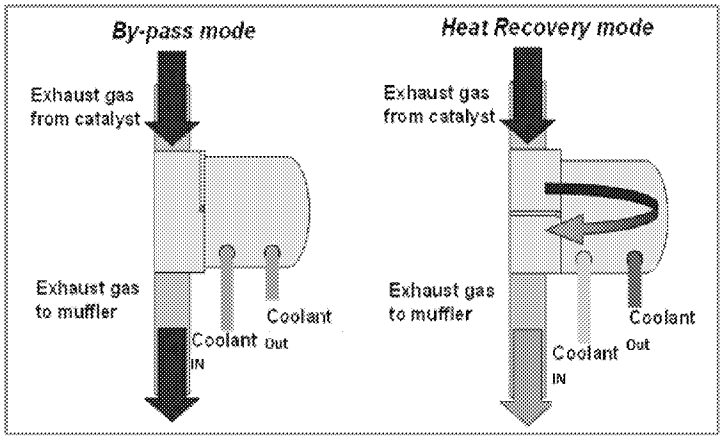


Figure 63: Sample illustration of EHRS coolant and exhaust plumbing

A powertrain EHRS can easily harness 600 kilojoules of heat energy over the FTP city cycle, resulting in an average heating power delivered to the coolant of approximately 320 watts. By referencing the waste heat recovery factor of 0.7 grams per 100 watts, the amount of g/mi CO_2 improvement is approximately 2.2 g/mi CO_2 for this technology.

Vehicles can be equipped with various combinations of warm-up technologies. Observing heating technology holistically, the exhaust heat recirculation system should be considered an enhancement multiplier to any one or combination of these devices. Incentivizing this technology will promote deployment. The exhaust heat recirculation system should be a multiplier to active engine warming, active transmission warming, and future active axle warming. With respect to the on-table credits available, FCA suggests that an EHRS multiplier of 1.2x (a 20% increase) is appropriate. The multiplier will produce a conservative enhancement for the various combinations of heat exchanger technologies.

[120] Edouard Barrieu, Faurecia, EHRS Impact on Engine Warm Up and Fuel Economy, Presentation at the U.S. Department of Energy's Directions in Engine-Efficiency and Emissions Research (DEER) Conference (Oct. 3–6, 2011), *available at* https://www.energy.gov/sites/prod/files/2014/03/f8/deer11_barrieu.pdf page 2

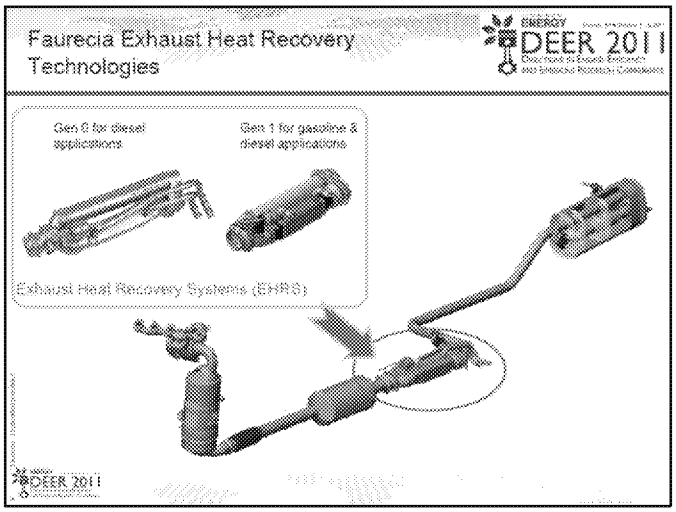


Figure 64: EHRS production example[121]

EHRS Multiplier Table			
Active Warm-Up Technology	Baseline Credit (g/mi CO_2 per vehicle)	EHRS Multiplier	Credit with EHRS Multiplier (g/mi CO_2 per vehicle)
Engine	1.5 (passenger car)	1.2	1.8 (passenger car)
	3.2 (light-duty truck)		3.8 (light-duty truck)
Transmission	1.5 (passenger car)		1.8 (passenger car)
	3.2 (light-duty truck)		3.8 (light-duty truck)
Rear Differential	1.5 (passenger car)		1.8 (passenger car)
	3.2 (light-duty truck)		3.8 (light-duty truck)
Engine + Transmission	3.0 (passenger car)		3.6 (passenger car)
	6.4 (light-duty truck)		7.7 (light-duty truck)
Engine + Rear Differential	3.0 (passenger car)		3.6 (passenger car)
	6.4 (light-duty truck)		7.7 (light-duty truck)
Transmission + Rear Differential	3.0 (passenger car)		3.6 (passenger car)
	6.4 (light-duty truck)		7.7 (light-duty truck)
Engine + Transmission + Rear Differential	4.5 (passenger car)		5.4 (passenger car)
	9.6 (light-duty truck)		11.5 (light-duty truck)

Cooled Exhaust Gas Recirculation Active Warm-Up

Similar to the EHRS, cooled exhaust gas recirculation (CEGR) removes heat from the exhaust stream and uses it to benefit coolant warming. The CEGR can be used without and EHRS, or it can be added as an additional component in combination with an EHRS. We therefore propose a multi-tiered credit schedule for these technologies which includes a multiplier for each of these independent pieces of the system. FCA suggests a CEGR multiplier of 1.1x (a 10% increase) and an EHRS multiplier of 1.2x (a 20% increase) that can be applied to the existing active warm-up credits on the vehicles. These include the active engine warm-up, active transmission warm-up and the heated rear differential warm-up credits, and each of these would increase by

[121] *Id.* at page 3

the relevant multiplier for the vehicles, based on the number of added exhaust heat recovery components that have been added.

Exhaust Heat Recirculation System and Cooled Exhaust Gas Recirculation Active Warm-Up Combined

FCA suggests that when a vehicle's powertrain is equipped with both EHRS and CEGR, that vehicle should receive a multiplier that represents the addition of each increase, or 1.3x (a 30% increase).

Appendix 3 –Scroll Technology A/C Compressor Slides

1. Background

MITSUBISHI

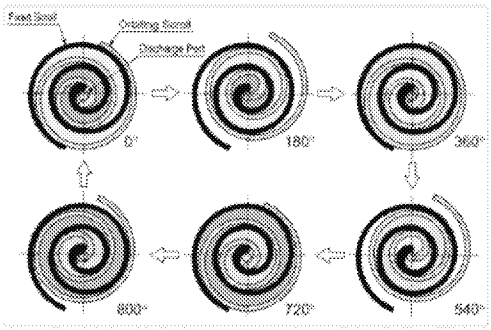
- *Based on the U.S. EPA MAC credit menu, as reduced reheat technology, a Fixed Displacement Compressor and External Variable Displacement Compressor (EVDC) have different credit values.*
- *Scroll A/C Compressors are well-known as an efficient fixed displacement technology.*
- *This document demonstrates the QSH Scroll A/C Compressor technology can provide the same HVAC Performance with reduced CO_2 emissions compared to EVDC technology based on A-B comparisons of bench and vehicle testing.*

2. Technology Description

MITSUBISHI HEAVY INDUSTRIES

- ***Scroll compressor's compression mechanism:***

- *Orbiting scroll is orbited around Fixed scroll.*
- *2 crescent shaped and point symmetry compression chambers are moving from out side to center reducing volume.*
- *The fluid is compressed and discharged through a port at center of the fixed scroll.*

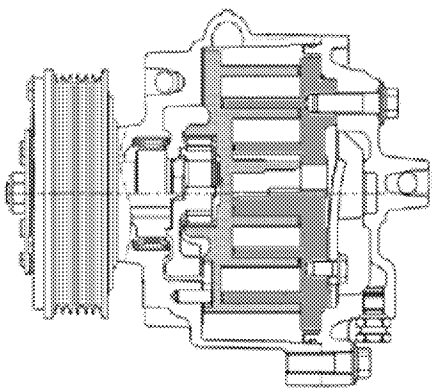


- ***The small orbiting radius provides a high COP (Coefficient of Performance) due to low friction loss.***
- ***The compression mechanism provides high volumetric efficiency due to low pressure loss.***
- ***Few moving internal parts and smooth rotation allows high speed operation due to low internal inertia.***

2. Technology Description

MITSUBISHI HEAVY INDUSTRIES

- ***Mitsubishi QSH Scroll compressor***

QSH scroll	Feature
High performance 3D profile 	➢ Outer Scroll wall height is tall ✓ Large effective capacity without enlarging the outside diameter. ➢ Inner Scroll wall height is short ✓ Providing high strength and high reliability. ➢ 3D Compression ✓ Optimum design of steps provides a high compression ratio with minimum leakage and re-expansion. ✓ 10% improvement in Idle performance. ➢ Direct Oil Return System (DORS) ✓ Allows for lower oil volume and qualifies for Oil Separator Menu Credit.

2. Technology Description

MITSUBISHI

- **Comparison "QSH scroll" and "EVDC piston"**

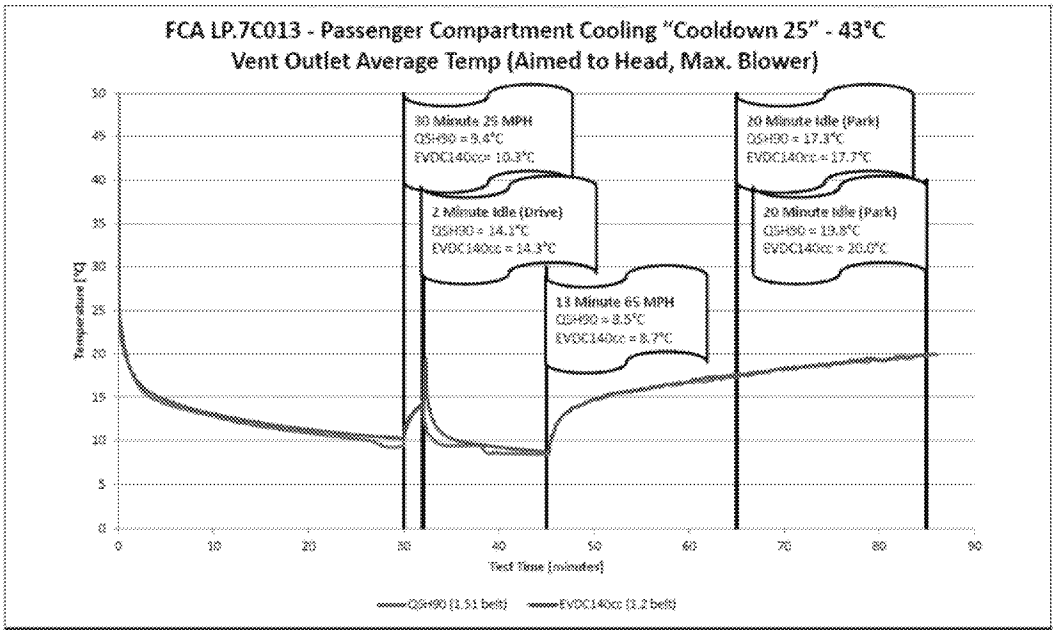
Item	EVDC Piston	QSH scroll	QSH benefit
High load condition	Similar to Fixed piston in case of full capacity.	QSH scroll improves Idle performance.	Comparable Idle performance with QSH technology
Low load condition	Demand capacity control can reduce re-heat loss.	Demand On/Off (cycling) control can reduce re-heat loss.	Reheat reduce can be applied by on/off setting program.
Vehicle interaction control	Vehicle acceleration / deceleration control is applied	Demand On/Off (cycling) control can be applied.	Similar control can be applied.
Drivability	Minimum On/Off operation.	Minimum On/Off jerking caused by low internal inertia and optimum engine fuel control.	Similar drivability with EVDC.

3. HVAC Performance Vehicle Benchmarking

MITSUBISHI

- ***Vehicle level performance tests completed on FCA Jeep Compass (2018-July) to evaluate cooling performance***
  - ***OE Compressor = 140cc EVDC (140 cc & 120 mm Clutch)***
  - ***vs. QSH90 (90 cc & 95 mm Clutch)***

3. HVAC Performance Vehicle Benchmarking

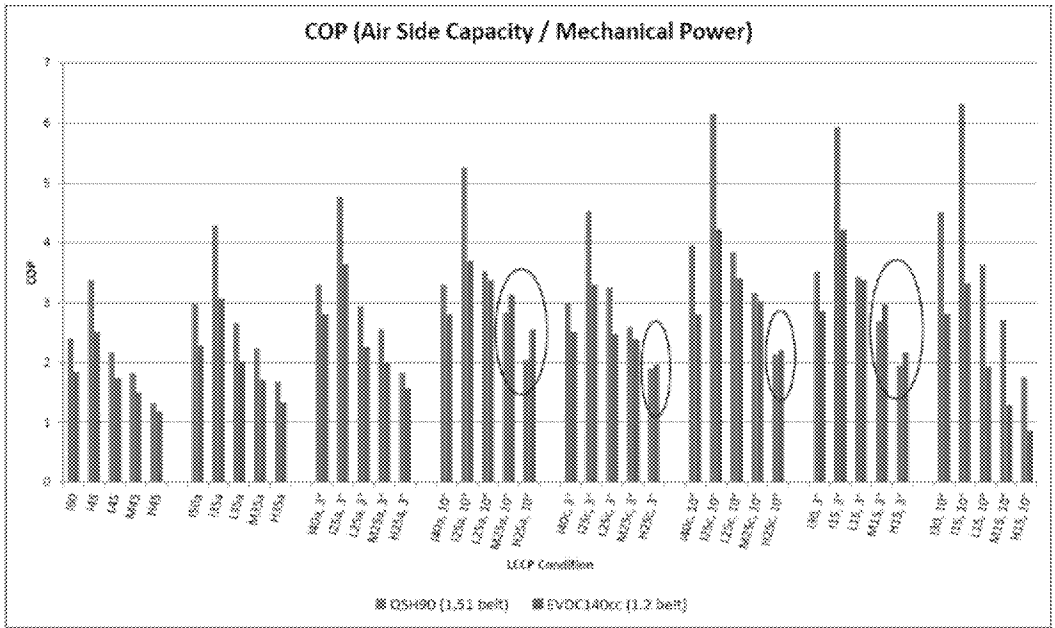


➢ *QSH90 has comparable performance to OE 140cc EVDC across all conditions*

4. LCCP Modeling

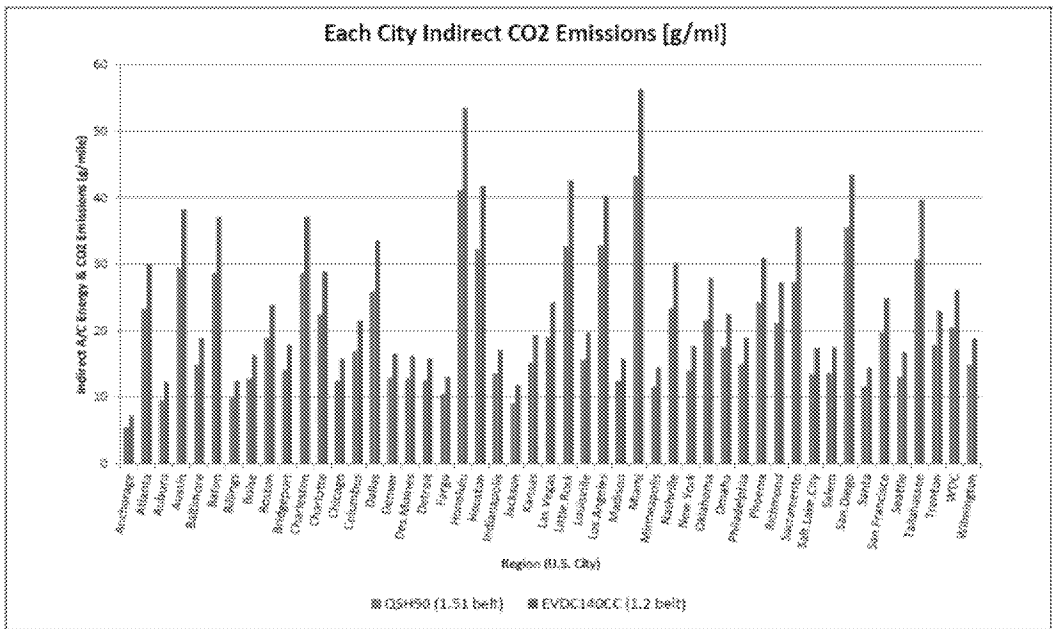
- *LCCP model (Life Cycle Climate Performance) is an evaluation of the global warming impact (CO2 emissions) of an A/C system.*
- *Component and system COP is a major influence of this evaluation method.*
- *The LCCP value is calculated using the mechanical power input and cooling capacity output measured from the system-level testing of 40 specific conditions defined in SAE J2765. All testing was conducted using a 2018 Jeep Compass HVAC System. The only modifications were to the suction discharge plumbing to accommodate the port locations of the QSH Compressor. In addition, the Compressor speed was scaled up for the QSH Compressor by 1.51/1.2 to reflect the conditions demonstrated under the vehicle performance testing.*
- *All tests & calculations were performed with R-1234yf*
- *LCCP results comparing the QSH90 to a leading 140cc EVDC technology are shown in the appendix.*

4. LCCP Modeling



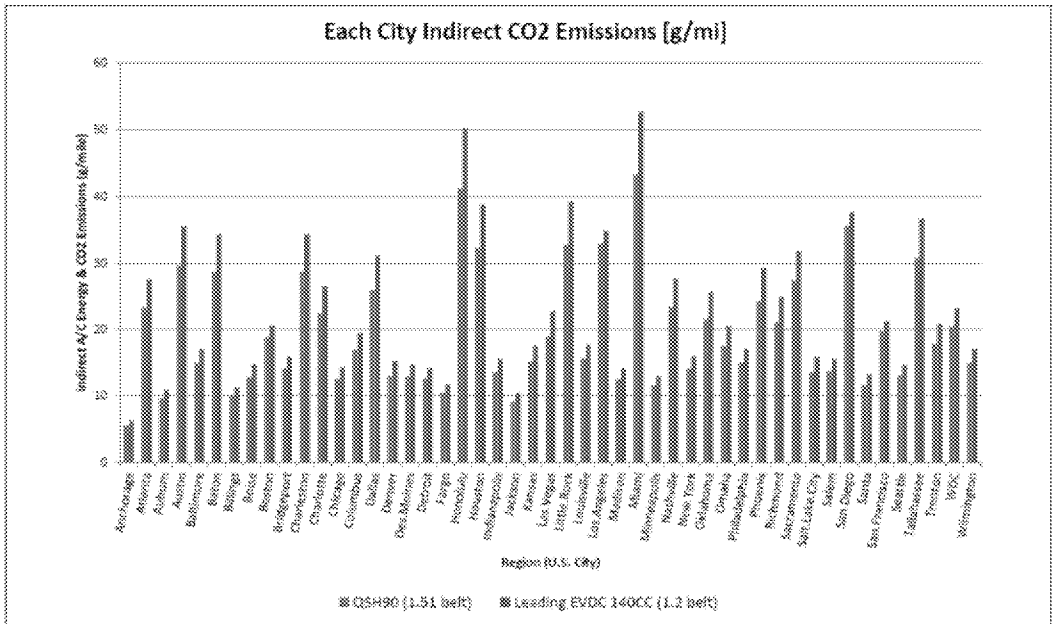
- QSH90 has higher COP under all but 6 of the 40 J2765 points tested resulting in an average overall 0.68 higher COP than OE 140cc EVDC.

4. LCCP Modeling



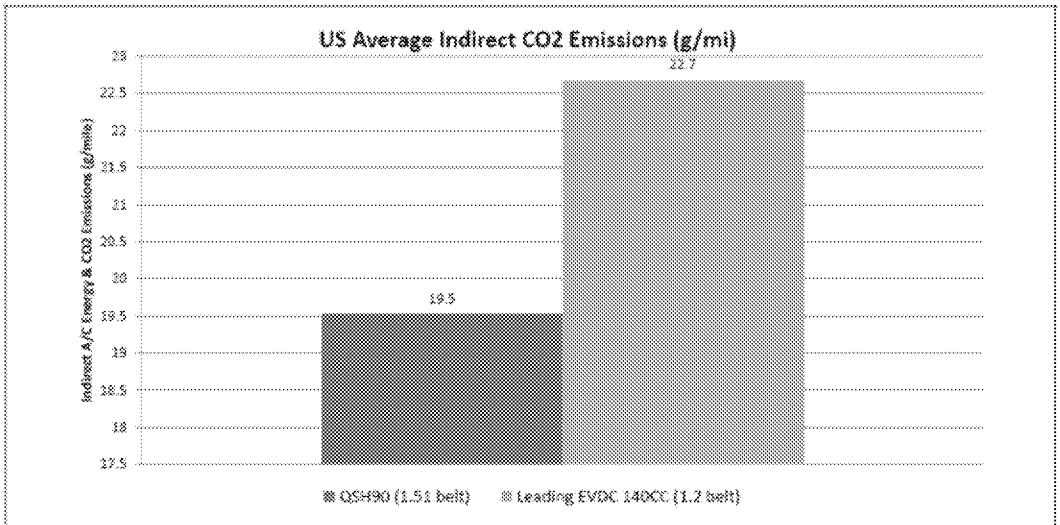
- The QSH Scroll compressor shows significant reduction of Indirect CO2emissions for each US city.

Appx. LCCP Modeling – QSH90 vs Leading 140cc EVDC



- The QSH Scroll compressor shows significant reduction of Indirect CO2emissions for each US city.

Appx. LCCP Modeling – QSH90 vs Leading 140cc EVDC



Average US Vehicle Indirect CO2 Emissions

QSH compressor	19.5 g/mi
Leading 140CC EVDC Compressor	22.7 g/mi
Benefit of QSH compressor	**3.2 g/mi**